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EDITORIAL

"To Train Men Liberally"

Doctor Wasteneys, in his address to the graduating class of medicine, stressed the value of a liberal education for all students in that course. The medical faculty has plans underway for revision of the present curriculum with the idea of combining two years of a liberal arts course with four years of training in the pre-clinical and clinical science of medicine.

This changing attitude toward undergraduate education reveals the fact that the profession, as a whole, has at last come to realize doctors cannot succeed by practicing only the science of medicine, but must also be aware of the art of medical practice.

It is often forgotten that medicine consists not only of diagnosis and treatment of structural disease, but also includes the ability to work with patients, to gain their confidence and to establish rapport between them and their medical adviser. It seems highly probable that medical students exposed for two years to the study of the liberal arts would gain some helpful modifications of their personality and manner, which a study in the purely medical sciences would not afford.

One of the schools in Boston has adopted as its motto "To train men liberally." By the word liberal we mean "free." To liberate means to give freedom, and a liberal education is one giving freedom to the mind and spirit of the person

thus educated. The mind and spirit of man are free to operate within certain boundaries determined greatly by the limitations of man's knowledge and experience and by limitations which his restricted experience has set upon his imagination. In other words we must train men to think along many lines, both scientific and cultural and as such to enlarge the fields of knowledge by which men are limited.

To quote President Nicholas Murray Butler of Columbia University: "If liberal education be even crippled much less abandoned, then no matter how successful vocational training may be, its products will not be men but machines." A doctor, lawyer or engineer whose work is limited to the application of material from text-books, or engineers' handbooks is essentially only an intricate machine, but to be liberally trained a man must have far more than just vocational skill.

One might ask, at this point, what are the liberal arts which should be supplemented by scientific training, to this question can be answered, that they are legion, but a few examples might be, world histories, studies of the literary classics, languages, philosophies, and last but not least, the various psychologies.

The medical profession, which has grown so large, and in these trying times is so busy dealing with suffering patients, has largely lost its personal touch and the ability to gain a true understanding of the human problems of patients in its charge. The art of practice has been crowded out by the urgent need of the science of the practice of medicine.

If the medical profession is to retain its present high place against a growing army of quacks and other irregulars, it must again recognize the later half of the science-art combination. In keeping with the Chinese proverb, "an ounce of prevention is worth a pound of cure," let us continue to maintain the medical profession in its enviable position by adequately modifying the educational methods during the stage of undergraduate training and combine the study of medical science with that of the arts to give a liberal education!

Erratum

The address to the graduating class in medicine, which appeared in the November issue, was delivered by Dr. H. Wasteneys, Professor and Head of the Department of Biochemistry at the University of Toronto.

The editorial staff apologizes for the omission of the speaker's name.

CONGENITAL DISLOCATION OF THE HIP

JOHN LAING McDONALD

Congenital Dislocation of the Hip-joint is the most common and most important of all congenital dislocations. It is more common in girls than in boys; the left hip is most frequently involved; the next most common variety is a double congenital dislocation and the least common is a congenital dislocation of the right hip alone.

There is considerable controversy about the cause of congenital dislocation of the hip, and also about the time at which the dislocation occurs. It is agreed that there is a strong hereditary factor. As to the time at which the dislocation occurs, we believe the following types may be recognized:-

1. The embryonic type, where the head of the femur developes out of the acetabulum.
2. The fetal type, in which the dislocation occurs during the fetal period.
3. The post-natal type, which occurs during or after birth, this latter variety being the most common.

Pathology — (See Figure 1.)

1. *Changes in the bone*—

(a) The acetabulum on the affected side is shallow, and tends to assume a triangular shape, with the base of the triangle directed downwards and forwards, and the apex above and posterior, where it is observed that the normal projecting shelf of the acetabulum is deficient.

(b) The head of the femur on the affected side is under-developed, appearing smaller than that on the opposite side, and as time goes on it tends to take on a flat appearance.

(c) The neck of the femur. This is shortened, with greater antiversion than normal, or to put it another way—the angle of declination is increased. By this I mean that if one passes a line through the centre of the femoral head, and a second line through the centre of the great trochanter in the normal individual, it will be observed that the line

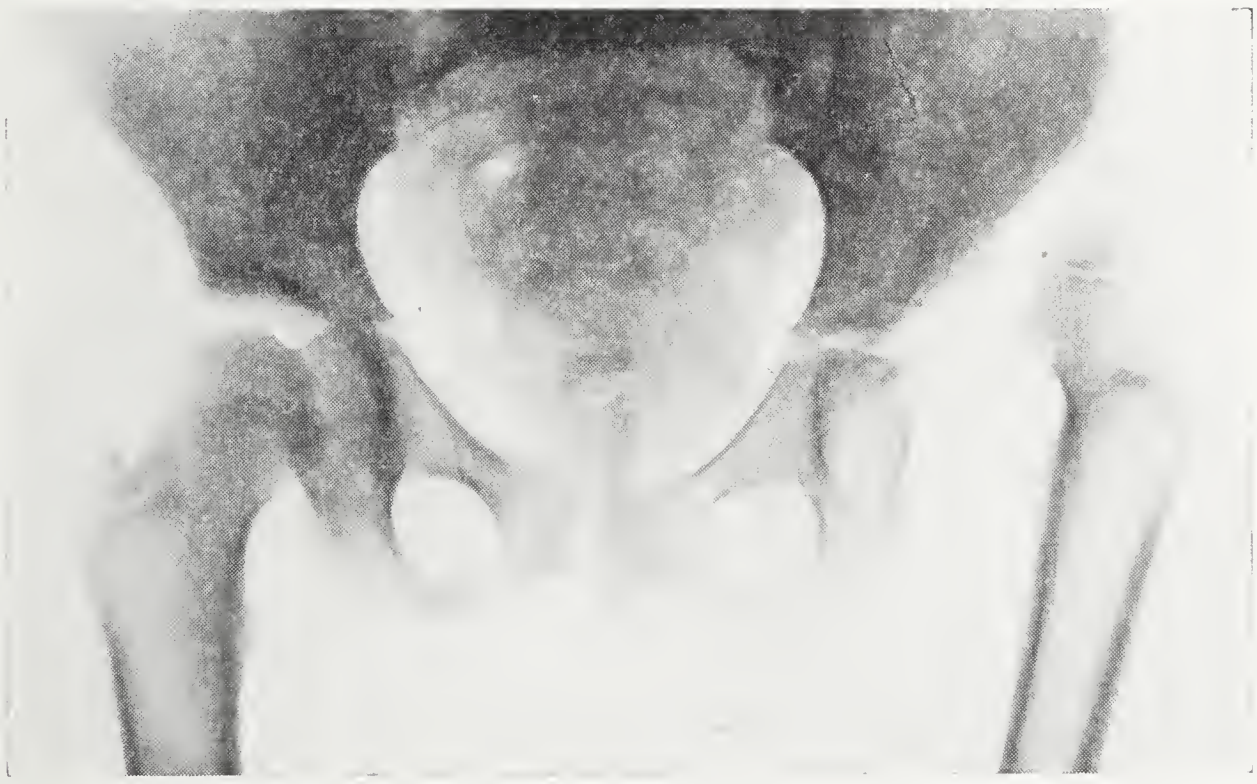

Fig. 1.—X-ray of congenital dislocation of the left hip.

of the latter declines from the former approximately twelve degrees. In congenital dislocation of the hip, this angle may be increased to as much as 90 degrees, so that the head of the femur looks directly forwards in relation to the femoral shaft and trochanter.

2. *Changes in the soft tissues*—

(a) The capsule.—This becomes stretched, and tends to become thickened as time goes on because as a result of the head of the femur being dislocated it is required to support some of the body weight on the affected side. In the high congenital dislocation, there may be an adherence of the deep surface of the capsule beneath the neck of the femur to the attachment of the capsule in the region of the superior brim of the acetabulum, as pointed out by Kidner.

(b) The muscles.—These may be divided into two groups—

1. The pelvi-crural group, consisting of the group of muscles travelling from the region of the hip to the region of the knee, and including the hamstrings, the adductors and quadriceps. These tend to be altered in length but not in function, that is the distance between their origin and insertion is decreased but their function remains the same.
2. The pelvi-trochanteric group. These tend to be altered in length as well as in function, and include the ilio-psoas, the obturators and the gluteals. As an example of the way they are altered in function—the ilio-psoas becomes lengthened and after travelling out of the pelvis passes upwards to its insertion into the lesser trochanter, so that instead of being a flexor of the hip alone, it now becomes a sling which helps to support part of the weight on the affected side.

Signs and Symptoms—

1. The leg on the affected side appears short.
2. The patient is observed to walk with a limp, in the case of a single congenital dislocation, with a distinct lurch to the affected side as the weight is taken on that leg; in the case of a double congenital dislocation, with a tendency to waddle.
3. Movements—Flexion, adduction, and internal rotation are increased. All other movements are decreased on the affected side.
4. The leg measures shorter than its fellow.
5. The trochanter on the affected side is high, that is it appears definitely above Nelaton's Line, or if one takes McCurdy's line which is a line joining up the pubic tubercle and the most prominent part of the great trochanter on either side, it is observed that on the affected side the trochanter appears high.
6. The head of the femur is not felt to roll beneath the pulsation of the femoral artery when one rotates the thigh on the affected side, the finger sinking into an unsupported Scarpa's Triangle.
7. The head of the femur on the affected side can be set outside the acetabulum low down on the dorsum ilii. This can be demonstrated by acutely flexing and internally rotating the hip on the affected side.
8. The X-ray shows the head of the femur out of the acetabulum and riding a variable distance upwards on the dorsum ilii on the affected side.

Treatment

Congenital dislocation of the hip is not frequently recognized until the child com-

mences to walk, and it is is important that the reduction of the dislocation be carried out as soon after the condition is recognized as possible, as it is the experience of all those concerned with the treatment of dislocation that the earlier the dislocation is reduced the better the result.

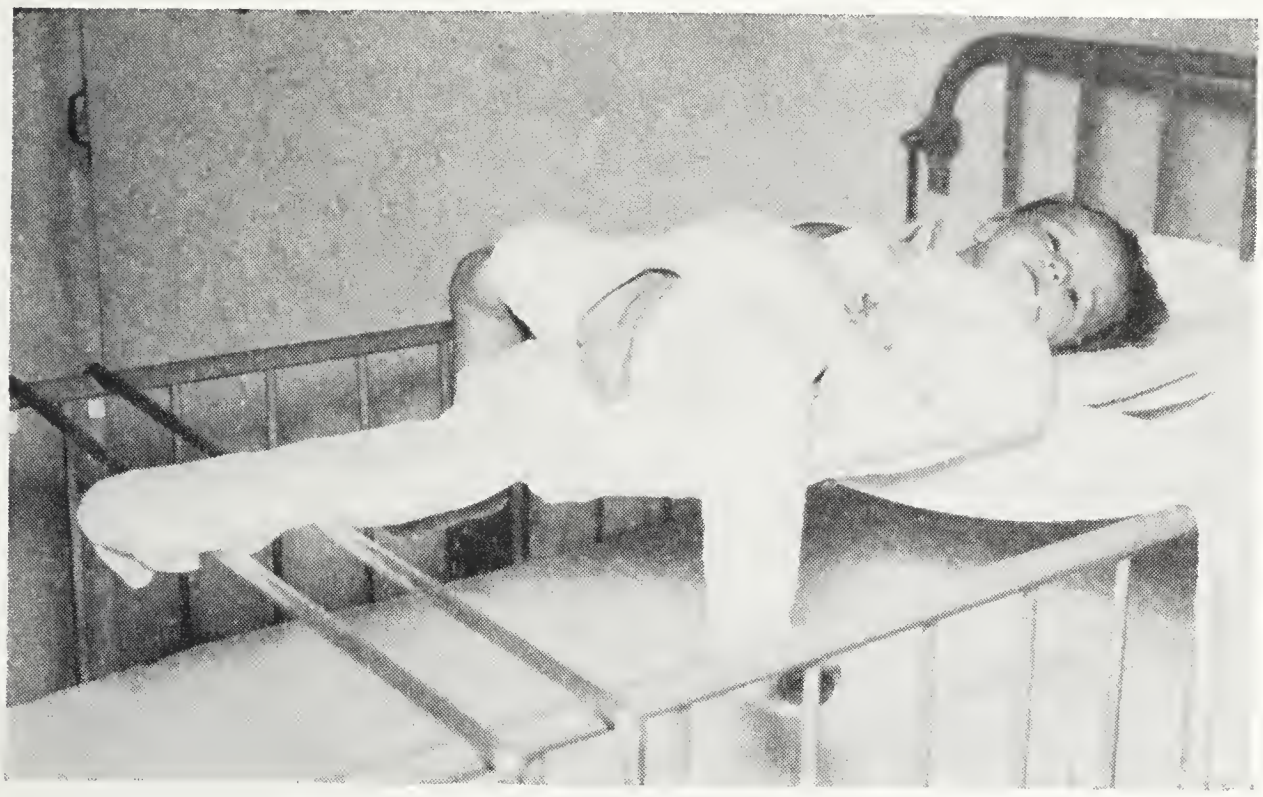

Fig. 2.—Child with congenital dislocation of the left hip, reduced and immobilized in plaster, lying on the special frame.

Method of Reduction

The method of reduction we carry out is similar to that originally described many years ago by Lorenz, and is carried out as follows:-

The patient is anaesthetized on a low table, the pelvis on the affected side being carried over towards the edge of the table. The assistant then firmly secures the pelvis to the table, while the surgeon carries out stretching—first of the hamstrings and later of the adductor muscles. The stretching of the hamstrings is carried out until one can flex the hip on the affected side to such an extent that the dorsum of the foot can be made to touch the shoulder on the opposite side with the knee extended. The stretching of the adductors is carried out until one can abduct the thigh on the affected side at right angles to the body. It should be emphasized that this stretching must be carried out gently in order to avoid damage to the femoral head and neck. After the stretching of the muscles is complete the surgeon grasps the flexed knee firmly with the right hand and supports the upper end of the thigh in the region of the great trochanter with the left, and then by exerting traction and outward circumduction with the right hand, the left hand lifts the trochanter with the femoral head over the posterior rim of the acetabulum into its socket, the reduction usually being accompanied by a distinct click which can be both heard and felt. If the reduction has been successful it is observed that there is now a fullness in the region of the upper part of Scarpa's Triangle and on rotating the thigh the reduced femoral head can be felt beneath the pulsation of the femoral artery.

Method of Immobilization

The affected hip is now immobilized in a plaster spica extending from the toes

to the waist-line with the thigh on the affected side held in the position of marked abduction and internal rotation. The plaster also includes the thigh on the opposite side as far as the knee to fix the pelvis. (See Figure 2.)

In the case of a double congenital dislocation, a procedure exactly similar to the above is carried out on either side, but in this case the plaster is carried from the toes to the waist-line on either side with the thighs held in a position of extreme abduction and internal rotation. (See Fig. 3) After the plaster has become dry the child is placed on a specially constructed frame (See Figure 3) designed to prevent soiling of the plaster from urine and faeces and to facilitate nursing.

Fig. 3.—Picture of a child with a double congenital dislocation of the hips, immobilized in plaster after reduction, lying on the special frame.

In three months the original plaster is changed, the degree of abduction of the thigh on the affected side being lessened about fifteen degrees. In two months the plaster is again changed, the degree of abduction of the thigh on the affected side being again decreased about fifteen degrees. After a further period of two months, or approximately seven months from the date of reduction of the dislocation, the plaster supporting the hips is removed and a new type of plaster applied, extending from the toes to the upper third of the thighs with the feet at right angles to the legs and the knees in a position of almost full extension, a Dennis-Browne foot-plate being placed in the sole-piece of the plaster. A Dennis-Browne cross-bar is then applied to the sole-plate on either side in such a way that the leg on the affected side is held in a position of marked internal rotation. The child is maintained in this type of plaster for a period of three months. This below-hip plaster, as it is sometimes called, maintains the hip on the affected side in a position of internal rotation, thereby tending to prevent recurrence of the dislocation, and at the same time allowing the child to engage in active movement of the hips on either side. We believe this is helpful in tending to develop both the head of the femur and the acetabulum.

In the case of a child where clinical examination and X-ray show the head of the femur to be displaced unusually high on the affected side, and where one feels that to attempt immediate reduction might lead to damage of the head and neck of the femur, we believe that traction should be applied for a period of two to three weeks in an effort to overcome the high displacement of the head. Figure 4 shows a child on a frame designed by Dr. W. S. Keith, which we have found to be an excellent way to obtain traction in a small child. It will be observed that adhesive traction has been applied to the leg and thigh on either side, carried from a stirrup over a pulley to a weight, the pulley being suspended from a frame that can be moved outwards, in this way gradually increasing the degree of abduction while still maintaining traction.

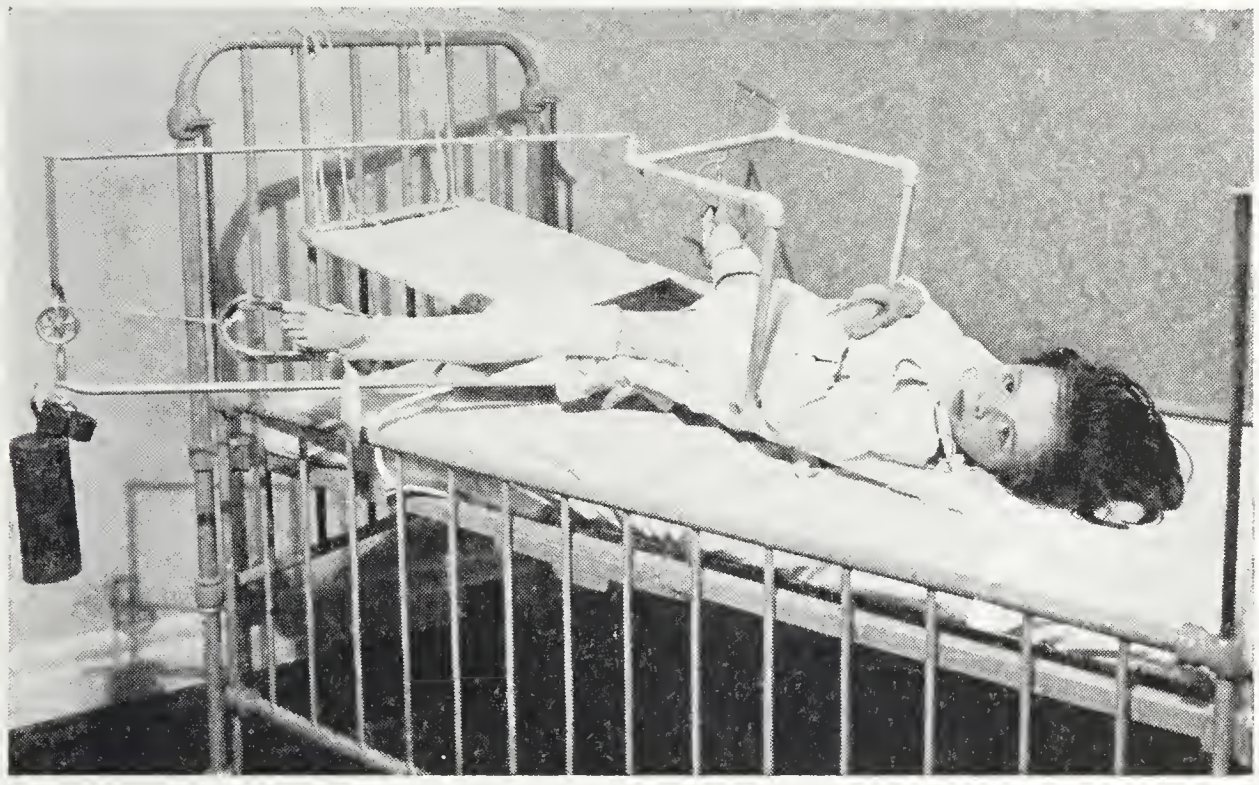

Fig. 4.—Child in a Keith Abduction Frame designed to permit traction in a gradually increasing degree of abduction in a child with a high dislocation of the femoral head.

After Care

After treatment in plaster has been completed and there is clinical and X-ray evidence of the reduction being successful, the child is then placed in the hands of the Physiotherapy Department to receive assistance in learning to walk. This frequently is a slow and discouraging period, the child frequently taking as long as a month before attempting to stand or walk without assistance.

Results

In assessing the results following the treatment of congenital dislocation of the hip, one has to distinguish between the clinical result and the X-ray result. In cases coming for treatment early, and in whom the foregoing treatment has been carried out carefully, one obtains a satisfactory clinical result in about 80% of cases. The X-ray result, however, is very different, and in only about 11% of cases does one get a hip on the affected side in which the acetabulum, head of the femur and neck, return to the appearance of the normal side.

PSYCHOSOMATIC MEDICINE

C. H. CAHN, M.D.

"This is the great error of our day in the treatment of the human body, that physicians separate the soul from the body.

". . . you ought not to attempt to cure the eyes without the head, or the head without the body, so neither ought you to attempt to cure the body without the soul; and this is the reason why the cure of many diseases is unknown to the physicians of Hellas, because they are ignorant of the whole, which ought to be studied also; for the part can never be well unless the whole is well."

PLATO'S DIALOGUES: CHARMIDES.

HISTORY

Psychosomatic medicine is nothing new. In 400 B.C. the Greek physicians were confronted with the mind-body relation in the treatment of their patients, as the writings of Plato well illustrate. During the dark Middle Ages (e.g. 11th century) the Church took care of people with mental symptoms. Several hundred years later the responsibility lay with the patient himself. When Macbeth asks the physician whether he cannot "minister to a mind diseas'd", the physician answers "therein the patient must minister to himself". (Macbeth Act V, Scene 3). The 17th century saw the first major developments of science.

Medicine has become a science in stages. At first there was chaos; magic, empiricism and quackery abounded everywhere. The use and abuse of all kinds of drugs and herbs for centuries, one can now say, has something of the nature of "placebos": the physiological effect of the medicine was unknown or guessed at but at least supposed to be harmless, whereas the psychological effect was meant to be quite definite. Then, scientific methods became more exact and observation of disease both during and after life became more accurate. As a result of the rapid advance during the middle of the 19th century of structural cellular pathology, all disease was thought to be classifiable into definite disease entities with definite organic lesions which should be found at autopsy. The bacteriological era that followed early pathology close on its heels was characterized by a somewhat similar conception, viz. that germs were the cause of all disease. During these times such variable factors as the patient's worries and complaints, his temperament and attitudes, in short, his personality as a whole, were still largely dealt with by the art of the bedside manner, and the physician continued to use methods of suggestion, persuasion and even hypnosis at random, according to his own judgment and experience.

Meanwhile psychiatry had been developing, at first out of pure regard to the mentally ill; these had been herded together in lunatic asylums where they were treated and maltreated like criminals. Only later did psychiatry become a science per se, a rather specialized one. There was as yet little thought of connecting psychiatry with general medicine, for how could anybody dare to suggest that a person with a physical illness might have anything wrong with his mind? But gradually, with the development of psychology, i.e. the study of the *normal* human mind, it was found that normal people like you or me frequently could not adjust *just* rightly to any situation they came up against, and under such circum-

stances showed signs of mental perturbation. This state of affairs has come to be very much more widely recognized in recent years, and a rapprochement between psychiatry and general medicine has become inevitable. Thus is being brought about the true revival of psychosomatic medicine, the realization that, in health or disease, the body cannot be separated from the mind, that these two form a uniform whole in the person's personality. (The next step is from the individual to society: as the scientific method is being applied to the study of the community, medicine also broadens out into the field of sociology and the supreme goal becomes "mens sana in corpore sano atque communitate sana".)

Definition

"Psychosomatic medicine is that part of medicine which is concerned with an appraisal of both the emotional and the physical mechanisms involved in the disease processes of the individual patient, with particular emphasis on the influence that these two factors exert on each other and on the individual as a whole."(9)

Basic Concepts

Although the above definition states that it is a part of medicine, psychosomatic medicine is *not* meant to be a specialty. It attempts to include all clinical medicine—for it accepts as its basis the theory of the *unity of the organism*. According to this simple theory, an equilibrium is maintained within every organism and between the organism and its environment. This equilibrium is the result of the interaction of the various biological processes that affect the organism, and includes such multidimensional factors as heredity and environment; growth, development, maturation and aging; body and mind; health and disease; individual personality and the place of the individual in the community. These factors are all interrelated in the life of the organism, and the isolation of any one factor from the others is an artificial process, that if employed for purposes of study and research, must result in biased or at least very incomplete conclusions on the part of the observer.

If this, the "organismal" theory, is applied to the practice of medicine, we at once see that, the patient being the organism under study, if we want to arrive at a true picture of the patient's condition, we have to consider not just one of these factors but, if possible, all of them. In many cases this seems quite unnecessary, for a certain factor, e.g. the tubercle bacillus, may predominate over all the others. In other cases, the apparently obvious factor may be, say, a "psychopathic personality". Suppose however that these two factors happen to act in the same individual: from the aetiological standpoint the patient has an antisocial predisposition; he neglects to avoid exposure to a person suffering from tuberculosis and becomes infected himself; later, knowing he is a sick man, he protests against the only socially acceptable treatment, namely in a sanatorium, by getting drunk or committing some other delinquent act. He is arrested and brought into court: after all the appropriate investigations implicitly demanded for the sake of public welfare have been made, it is decided that the patient is to be isolated so that he no longer will endanger the community by spreading infection and/or committing crimes; and efforts are made to readjust his life for his own benefit too. The best solution of the problem may not be found, but this example illustrates rather clearly a situation that is present, usually not so conspicuously but occurring to a very great extent in the

general population, and the medical practitioner is often required to deal with such situations.

Perhaps the simplest justification for cultivating the psychosomatic outlook in medicine is the fact of the existence of the disease itself. The dis-eased patient *feels* something is wrong. How can anybody (any body) *feel* without having a mind, a nervous system to feel with? Suffering is the effect of the registration of pain, grief or other disablement on the mind, and the longer the suffering the more profound the effect, both on the patient's mind and his body.

Thus psychosomatic medicine no longer accepts the "Either functional Or organic" concept, but the fundamental question to ask oneself when making a diagnosis is: "How much of the manifestations of the patient's disease is due to physical, AND how much is due to psychical and emotional factors?"

Need for Psychosomatic Medicine

From the above introductory remarks it follows that for the physician it is essentail to appreciate *all* the possible causes of the ailments that his patients consult him for. Some of those factors that often prevent such a complete diagnosis to be made will now be considered:

1. The gap between clinical medicine and surgery on one hand and psychiatry on the other.—As was seen above this is mainly a historical consequense. Medical thought in the 19th century concentrated chiefly on cellular dysfunctions—pathological physiology—and owing to the relative successes in this branch of medicine and relative failures of psychiatry the study of mental abnormalities was for the time being left in the background. The process of the integration of these two subjects is a gradual one, because it implies a definite change of outlook, from the narrow, organic, to the broader, organismal, point of view. Eventually internal medicine and psychiatry will find their proper place in the great field of medicine as a whole.

2. The way that medicine is being practised to-day.—Let us consider the position of the doctor in society: In times past the physician's bedside manner, the *art* of medicine, was supposed to deal adequatey with all the patient's various little eccentricities that entered into the general picture. The doctor in his therapy had to make use of and rely on his intuition, his own personality, as the patient's soother and adviser as well as his healer. In more recent times the stabilizing influences of society, that used to allow a doctor to get to know his patients as human beings and watch over them practically for life, have been largely overthrown, and not only do patients change doctors much more frequently but also the incidence of emotional upsets seems to be greatly increased; the doctor-patient relationship has become more heterogenous and further unknown factors and complications have frequently arisen. And also since observation at the bedside has apparently to many doctors been decreasing in importance as extraclinical methods of diagnosis have become more accurate, an unfortunate concept, that of the patient as a "*case* of such-and-such a disease", rather than as a *sick human being,* has become more prominent.

3. The tendency to overspecialization. —In a great number of sick persons, when first seen by a physician, one part or system seems to be especially at fault. Before the physician makes many enquiries, or because he is not familiar with the special problem, or indeed because of the ready availability of a specialist, the latter is called in. Naturally the specialist is most interested in

the pathology of the part involved, and his efforts will be directed chiefly at putting that part right. How often, however, does he fully realize that he is actually faced with a human being and not a part thereof? Some force is needed to re-orientate and unify the various specialties, a liaison officer, so to speak, whose function is to co-ordinate apparently disconnected facts and events, for the greatest benefit to the patient.

4. The present organization of hospitals.—Of course it is necessary for hospitals, especially general hospitals, to be divided into departments, and each department to have its own specialists. But no doubt many patients cannot thus receive the very best care possible, because again the attention of the attending physician or surgeon is more easily directed on to one system that is diseased rather than on the patient as a whole (this is especially noticeable to many medical students as they enter the clinical part of their medical training). It has been stated that "the hospital is a mosaic of specialties, with the unity missing".(1)

5. The high incidence of those diseases of which the aetiology is not at all, or only imperfectly, known. The following more or less chronic conditions deserve special mention: diabetes, hypertension, rheumatic and rheumatoid diseases, the various allergic states, peptic ulcer and ulcerative colitis, gall stones, hyperthyroidism, and dysmenorrhoea. Isn't it possible, or even likely, that in these and many other diseases, psychological factors play rather important rôles in their pathogenesis, at least as predisposing causes? The fact that many thousands of cases have been reported in medical literature where psychogenic factors were definitely present (1) would strongly suggest that the answer is yes. Looking at the diseases listed above it is a striking fact that many of them affect relatively young people, and in these the prognosis, from the psychotherapeutic standpoint, is generally good.

6. The success of non-medical practitioners.—Such large numbers of people have placed their faith in the more "spiritual" and other suggestive methods of treatment that this state of affairs reflects on the attitude of the medical profession, that attitude that ignores or even refutes the possibility of a patient getting better by means of psychotherapeutic guidance and active mental hygiene. Perhaps if doctors of medicine would regard with greater favour the "spiritual needs" of people in distress they might take the sting out of the thorn in the flesh from the "irregulars".

7. Lack of recognition of the patient's emotional immaturity or instability.—The methods ordinarily employed by medical men for the investigation of a patient's condition often are quite inadequate for the diagnosis of the "functional" aspects of the patient's condition. The excuse sometimes given is lack of time, but if the patient does not improve as rapidly as he otherwise might, is not more time lost than gained? Another tendency is to use "dragnet methods", i.e. when a diagnosis is obscure, all sorts of special physical and laboratory examinations are made, even exploratory operations, and then many different palliative treatments are prescribed one after the other, with the hope that at least one of them may be beneficial. If this is not the case, the patient is finally dismissed as having some "constitutional predisposition", all hope is given up, or possibly he may be referred to a psychiatrist. It is in such cases as these that the psychosomatic history comes in as an additional, long-and much-neglected weapon, and it may turn out to be of real value.

THE PSYCHOSOMATIC MEDICAL HISTORY

To arrive at the most efficient way of eliciting all the information from the patient (and his relatives and friends) in order to make a complete diagnosis, one has to consider (a) the urgency of the situation and condition of the patient, (b) those methods of investigation that are likely to give the best results, (c) the physician's ability to apply his knowledge of physiological-and psychological-dynamic processes involved, and (d) the organization in the physician's mind of (a), (b) and (c) so that the best order of sequence for the various methods of enquiry can be employed. Obviously if the patient is acutely ill and the diagnosis clear, no detailed examination of any remote system need be made at the beginning. But the more obscure the diagnosis, and the more chronic the condition of the patient, the greater the need for full psychosomatic investigation. After the routine history and physical examination there may be certain indications to carry out special tests. This may include a more or less complete personality study of the patient—e.g. under the headings: capacities, emotions, traits, attitudes, ego(10). The aim is to "attempt to find out the weak spots, congenital or acquired, and to obtain an explanation of the patient's failure to adjust himself to his environment."(12) It should be thus possible "to reveal the areas of life adjustment in which the patient's major difficulties have occurred, together with his characteristic patterns of dealing with them."(2) Then the physician should determine "the relationship to symptom formation, on the one hand of character, on the other of somatic make-up."(2) Thus he will be able to obtain a stereoscopic picture of the patient's disease. Let us for a moment consider present methods of history taking:-

1. *The medical history.*—This is usually very satisfactory for determining in a given patient the state of physical health and the onset, course and present extent of organic lesions; it may also give an indication, under the heading "family history", of hereditary influences, and under the heading "personal history", of some of the influences of environment, e.g. education, occupation, hobbies and addictions. But not much more than that, and in general only most superficially; what picture the physician does get of the patient's personality is derived largely from direct observation only, and often this is not any too thorough either.

2. *The psychiatric history.*—If it is discovered patient shows pronounced signs of some mental abnormality, the taking of a psychiatric history is indicated. This goes to the other extreme, for usually the psychiatrist carries out a fairly complete analysis of the patient's mental functioning, and then any relevant physical complaints are often regarded as secondary to the underlying psychopathology.

3. *The social history.*—If the patient's circumstances demand an investigation into his life at home and at work, the social history usually gives additional valuable information. But of course it does not attempt to go into any medical details.

If all three, the medical, the psychiatric and the social histories of one patient are taken, *wide divergencies* will be noted in their comparative study afterwards. The patient is seen from three different angles, whereas in reality he is somewhere in between. Something unifying is needed, and the psychosomatic history endeavours to achieve this unity.

Anyone who wishes to familiarize himself with methods of psychosomatic history taking would be better off if he first studied the principles of psychiatric

history taking and of psychoanalysis; for psychodynamic mechanisms occur largely in the unconscious mind, and the important thing may be to make the patient remember past events which he has forgotten. Further, it may be dangerous for the patient if the untrained medical man "dabbles in psychoanalysis". However the general practitioner usually has had enough training and experience to investigate and interpret at least the more superficial emotional disturbances of a patient, or, if necessary, to refer him for more intensive psychiatric enquiry.

It is the patients, who are sufficiently unbalanced (emotionally and otherwise) not to be cured of their difficulties by mere encouragement and sympathy, but at the same time not really mentally ill enough to need special psychiatric care, that do best if managed by the general practitioner according to psychosomatic principles. And such patients make up a considerable proportion of any medical practice.

The best way to conduct a thorough investigation of a patient presenting himself for the first time is probably to take a routine medical history first, with some emphasis on "personal and family history and past health and illnesses". If it is then determined that the "psychogenic factor" is at all prominent, a full personality study, probably at a second or third session, should be carried out.

However let us first consider how the routine medical history can be improved so that a better impression of the patient's ways of reacting to his environment can be obtained in the mind of the examiner right at the first meeting. Thus in a patient in whom it appears likely from his complaints and the findings on functional enquiry that he is not a straightforward case of a definite organic disease, the main headings of the subsequent search for information should be the following:

A. Personal History.
   1. Infancy and childhood.
   2. School history.
   3. Problems of adolescence and sex.
   4. Home life.
   5. Occupational history.
   6. Social adjustment and ambitions.
   7. Recreation and rest.

B. Previous Health.
   1. Patient's attitude to his own physical status and personality.
   2. Periods of special stress and strain.
   3. Past illnesses and operations.
   4. Period before onset of present illness.
   5. Course of present illness.
   6. Attitude towards illness.
   7. Attitude towards and experience with doctors.

C. Family History.
   1. Hereditary influences.
   2. Causes of illnesses and death of relatives and close friends.
   3. Ages of relatives and friends at their deaths.
   4. Age of patient at the time.
   5. Closeness of patient's association with relatives' or friends' illnesses.
   6. Patient's reactions to their terminal and other illnesses.
   7. Similarities that patient may have noticed between their ailment and his own.

The questioning along these lines demands a great amount of skill, tact and patience on the part of the examiner in guiding the discussion yet never influencing the patient in a way that might result in prejudiced replies. (The problem whether to record the patient's

statements en passant, or rather not to disturb the thread of the conversation with note-taking but summing it all up at the end, must be left to each examiner himself; probably the latter method is better, noting down only a few key phrases during the interview.)

The patient may not be prepared at all for this part of the examination, but a short explanation to him of the rôle of emotional factors in the production of certain symptoms, and then for instance a brief advice that he should have as much respect for emotions as for the germs of tuberculosis, may suffice. However the patient should not be told that his case needs very careful investigation, or otherwise be made believe that there is something seriously wrong with him, if it is only a matter of a minor emotional upset.—If complete rapport has not been established at this stage it is better to go ahead with the physical examination, and do a more complete personaltiy appraisal at a subsequent session. When this opportunity has arrived, the investigation should be continued along the lines indicated above, or, rather repeated in greater detail, with a view to finding an explanation for the patient's organization of his symptoms and his other patterns of reaction. The use of additional techniques may be indicated, such as the analysis of dreams, the examination of the patient after he has been made to relax, making greater use of the physician-patient relationship, employing free-association tests, or even using full psychoanalysis.

Evaluations of Findings—Diagnosis

Depending on the thoroughness with which an investigation as described above has been carried out, a more or less definite diagnosis can usually be made. It is best to use dynamic language, i.e. to explain the condition of the patient in terms of physiological, psychological and pathological *processes* that have been going on in the course of time and have lead up to the present situation, rather than merely mentioning the state of affairs as it has been found to exist at the moment.

Now, in making the diagnosis and prognosis, the following steps should be taken:-

1. A *chronological correlation* should be made of the various upsetting events in the patient's life history with the patient's response as manifested by the symptoms he showed at the time or immediately after these events.

2. Any sources of error should be investigated.

3. The attitude and any inconsistencies of the patient should be evaluated.

4. The patient's *"will to get well"* should be determined, using the following criteria:

(a) Adaptability to environment
(b) Insight—of normal biological processes
—of organic disease if present
—of emotional disturbances
(c) Fear of death or chronic invalidism
(d) Plans for the future
(e) Amount of rapport and co-operation with doctor(s) in attendance.

5. The possibility should be considered that certain apparently irremediable symptoms may serve the patient a definite purpose or may at least have a meaning to him from the standpoint of behaviour (Organ Language) (11).

6. The results of any additional tests employed should be evaluated.

Finally, after the physician has gone through all these procedures, he will be able to form a pretty definite opinion of the patient's state of body-and-mind, and

he can then decide with much greater assurance what to do in order to send the patient back on the road to health and well-being.

Treatment

It is not proposed here to deal with methods of psychosomatic treatment in detail; only some of the general principles will be outlined.

1. *Taking the history.*—This procedure in itself is already part of the treatment, for it acts as "mental catharsis" in that the patient in telling his story relieves some of the tension which had accumulated in his mind and body from the puzzling processes that had taken place as his symptoms were developing; also, from the inquiries the physician makes, the patient automatically deduces some of the factors that are essential to the physician's understanding of his condition, and thereby he gains in insight.

2. *Presentation of diagnosis.*—This is a more important form of treatment than 1., and on it depends greatly the patient's subsequent behaviour; for the patient will be able to form his own opinion of his condition, and the course to follow, more definitely when he knows "what is wrong with him"; but if he is not properly informed, his state of anxiety with regard to his present condition and an uncertain future will persist or increase. Of course there are patients with very poor insight, and then the situation often arises where, in the presence of a condition of serious prognosis as yet unknown to the patient, it is difficult for the physician to know just what to tell him. Leaving the patient in a state of "happy ignorance" may be excusable under such circumstances; but a close relative or friend should, if possible, be informed of all the facts. However, if a patient, whose symptoms are found to be both organic and functional in character, is intelligent enough and willing to co-operate, he should be told that his disability is out of proportion to the findings of physical examination, and that a disturbance in his emotional life may be (at least partially) responsible. This disturbance should be explained to him in language that he can understand.

3. *Informing the patient of the treatment to be recommended.*—For many a patient it is important to know the rationale of the treatment prescribed; hence an explanation to the patient of the principles involved may be very helpful.

4. *Actual treatment.*—The patient's confidence in his doctor of course depends chiefly on the results obtained from treatment. Now any materialistic form of treatment, whether by drugs, diet, mechanical appliances, operation, physiotherapy etc., is always accompanied by a certain psychological reaction (except perhaps if, and while, a patient is unconscious); this may be purely incidental, or it may be purposive, the physician having decided to employ psychotherapy. The former is uncontrolled and may lead to unforeseen results, whereas with the latter the physician has a certain aim in mind and hence the result should be less haphazard and more easily predictable. Thus the psychic significance of any somatic procedure should be considered in each case. Of the various psychotherapeutic techniques (giving counsel, suggestion and persuasion, hypnosis, psychoanalysis, occupational therapy, etc.) it needs only to be mentioned here that the general practitioner should know the indications for each.

A recent development is that of *group psychotherapy*. This method of treatment is especially applicable in the Armed Services. It has also been used with success in civilian practice(5) for instance for those patients who have had

long, unproductive medical treatments or who have been told repeatedly that they are imagining their illness; the most remarkable improvement with group therapy for these patients is the loss of their sense of isolation—being together with a number of other people with similiar problems helps to restore their self-confidence mutually.

A few points that deserve special mention now are the following:-

1. It is not wise to give too much advice to a patient, rather let him work out his own plan once he understands the situation; he should not be too dependent on other people, least of all his physician.

2. It may be worth while to say to a patient: "To have symptoms as a result of emotion is not a sign of weakness".

3. If prolonged rest forms part of a patient's treatment it should be remembered that thereby the patient may be removed from the life struggle and this does not often make the patient understand himself better.

4. For a patient who has a lot of things wrong with him physically as well as mentally, a change of environment and daily routine may be very beneficial.

5. In most patients with emotional difficulties psychotherapy if carried out along the lines indicated above gives favourable results, unless the maladjustment is too far advanced. Therefore the chief principle should be, as in all medicine: *Early diagnosis and Early treatment.*

6. From the above discussion of psychosomatic treatment it will be seen that the *physician's own personality* is of considerable importance in the management of certain patients, especially those who are emotionally unstable and suggestible; one physician can help a patient a lot because he is pleasant and tactful, yet another may by his manner antagonize the patient and even increase the patient's anxiety. Therefore the maxim: Know Thyself! applies particularly well to members of the medical profession.

Relevance of Age

7. Relevance of age. The method of psychosomatic investigation and treatment cannot be carried out properly without having regard for the age of the patient. For instance, it would be futile to tell a 70 year old man with heart disease and cardiac neurosis that he is emotionally immature and that he must change his way of living in order to make a healthy adjustment to his condition. Similarly, to explain to a nervous girl of 16 with rheumatoid arthritis that she is unable to satisfy various biological needs and that she should acknowledge her frustrations may be definitely harmful.

Briefly, running through man's life-span, the following are the chief methods of management of each age group:

Childhood—establishment of good habits, prevention of development of bad ones.

Adolescence—health and sex education, development of philosophy of life, friendships.

Adult Life and Parenthood—readjustment if necessary of mode of living, "facing facts".

Climacteric—realization and acceptance of onset of degenerative processes, prevention of development of too rigid attitudes.

Old Age—adjustment to gradual withdrawal from active life, occupational therapy.

Mental Hygiene

The importance of this aspect of healthful living may here be reiterated as the chief basis of psychosomatic prophylaxis. These are its main principles: (10).

—physical health
—emotional and social security
—satisfying work
—recreation, interests and hobbies
—friends and companions
—compelling objectives
—philosophy of life.

Summary

In the above essay the importance of psychosomatic medicine is emphasized (I) from the historical point of view, (II) from a consideration of the fundamental unity of the body-mind relationship in the organism, (III) because of various deficiencies in the way medicine has been and still is being practised, (IV) because psychosomatic methods can be used to great advantage in patients with certain chronic conditions—80% of whom, according to one author's series of serial admissions to a general hospital were found to have had emotional difficulties that had to do with the origin or course of the disease under study(2). The bearing of psychosomatic concepts on history taking, diagnosis, treatment and the age of the patient is pointed out, and suggestions are made to help both patients and physicians in solving some of their respective problems.

It should be remembered that "illness is a dispute between the patient and his disease"(2), therefore it is best to treat the patient first, his disease second, and his symptoms last.

Conclusions

While scientists and philosophers still search for and argue about a satisfactory basis to explain the origin, co-existence, relation and interaction of psyche and soma, medicine has gone ahead and has applied scientific methods of observation and evaluation of facts for the benefit of sick people, both their bodies and their minds. Also more and more attention is being paid to preventive medicine, which includes mental as well as physical hygiene, and to the improvement and cultivation of positive health.

The conception of psychosomatic medicine, although a very old one, is now regaining lost ground. The "organismal theory" as elaborated above provides a suitable foundation for the application of our knowledge to the objective and the subjective aspects of disease, and also of health.

What is needed in the future is a further development and consolidation of this concept. The notable contributions of Pavlov's school of the study of conditioned reflexes, and those of Cannon and his associates on the function of the autonomic nervous system, have already for long given an indication in which direction research on these fundamental principles should be pursued. There is a wide field open for the investigation of psychosomatic interrelationships, as is amply demonstrated by Dunbar's work at Columbia University in New York. The recent publications of her books(1, 2); of a textbook of psychosomatic medicine by Weiss & English(11); of the quarterly journal "Psychosomatic Medicine" (7); of an introductory chapter, on psychosomatic medicine, in the 15th edition —the latest—of Osler's textbook of medicine(9); and of an ever increasing number of articles on subjects with psychosomatic aspects in most of the current medical journals(3,6,8,12) afford a good illustration of one more interesting development in modern medicine.

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A few remarks on the term "Psychosomatic":

The word is long and unwieldy, and implies a division into psychic and somatic phases. However, "the dichotomy exists

between the disciplines of physiology and internal medicine on the one hand, and psychology and psychiatry on the other, i.e. in the mind of the observer, not in the organism observed"(1) For the two aspects cannot be isolated from each other (except artificially) when one considers the fundamental unity of the organism. Eventually, as medical thought comes to accept the concept of psychosomatic medicine more, it will be realized that in a way all medicine is psychosomatic, and then the term may be dropped altogether.

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The writer wishes to thank several of his classmates, and also Dr. G. S. Young especially, for helpful constructive criticism and encouragement. Many aspects of this still very controversial subject could only be barely mentioned, whilst others received perhaps too much attention. Discussions and criticisms are cordially invited.

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THE INTERPRETATION OF ELECTROCARDIOGRAMS*

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Eighty years ago, it was discovered that with each beat of the frog's heart, a change in electrical potential resulted which could be recorded. Not until 1887 was it possible to make such records of the human heart. At that time Waller, using an instrument termed the capillary electrometer, showed variations in the level of a mercury column, caused by the human heart beat. The instrument was not connected with the heart, but to various parts of the surface of the body, which showed a potential difference due to cardiac contraction. While it was possible to record photographically changes in the level of the mercury column, the inertia of the column was so great that only gross changes were discernible.

In 1903, the introduction of an extremely sensitive "string galvanometer" by Einthoven, made practical the recording of human electrocardiograms. In recent years vacuum tube amplification has permitted the successful use of much less sensitive galvanometers. The acceptance of these latter instruments is based upon their ability to duplicate the original tracings of the Einthoven galvanometer. The genius of Einthoven will long be remembered by cardiologists. Many years after the discovery of the galvanometer a friend wrote Einthoven, congratulating him upon the success of his instrument, but stating that while the instrument could write, it was a great pity that it could not also read. Einthoven replied that his galvanometer was not only able to write, but that it read secrets of the heart never before known.

For many years the electrocardiogram has consisted of three recordings, termed the three leads. The first lead is obtained by placing electrodes upon the patient's right arm and left arm. These electrodes are small metal plates which make an electrical connection with the skin through the medium of a salt and water pad, or in some similar manner. The second lead is obtained in the same manner but utilizing the right arm and left leg; and the third lead, from the left arm and left leg. In recent years, a fourth lead has been added. In this lead one electrode is placed over the precordium—usually in the region of the cardiac apex, and the second electrode on the posterior wall of the left chest or upon the left leg. Information is sometimes found in the fourth lead which is lacking in the three conventional leads; more often the fourth lead is merely confirmatory in nature. It is interesting to note that fifty years ago, Waller used all of these leads, as well as several others now considered unnecessary.

When the electrocardiograph is operating, but before the patient is included in the circuit, the galvanometer string casts a shadow upon the moving film which leaves a heavy line termed the base-line, or more technically, the iso-electric line. With the patient attached, a series of deflections above and below the base-line appear, and these recur in an identical manner with

*From the Cardiac Department of the Toronto Western Hospital.

each heart beat. There are five main deflections or waves, and these are arbitrarily designated as the P, Q, R, S, and T waves. To facilitate measuring the height or depth of these waves, the film bears horizontal markings one millimetre apart. Each fifth line is accentuated so that centimetres and half centimetres are clearly seen. The element of time is also recorded on the film, the latter moving at a rate of one inch to the second, or frequently at a faster rate. Vertical lines on the film record time intervals of 1-25 of one second, each fifth line being accentuated so that the time in fifths of a second is more easily recognizable.

An impulse from the sino-auricular node (pace-maker) initiates cardiac contraction. This impulse spreads in all directions through the auricular musculature, causing contraction and a coincident alteration in electrical potential recorded in the electrocardiogram as the P wave. The P wave therefore indicates contraction of the auricles, and it is missing from the tracing if the auricles do not contract as in auricular fibrillation. When the stimulus for contraction is picked up by the auriculo-ventricular node it passes, after slight delay, onward to the adjoining bundle of His, and thence through the two main branches of the bundle, and their terminal arborizations to quickly reach all parts of the musculature of the ventricles at approximately the same moment, so that a uniform and effective ventricular contraction may result. The passage through the ventricular portion of the bundle and its branches is coincident in the electrocardiogram with the Q, R, and S waves, the latter often being referred to as the QRS complex. Toward the end of this complex the ventricles commence contracting. After a short iso-electric period the T wave appears in the electrocardiogram, and the termination of this wave marks the end of the ventricular contraction. A period of rest ensues, during which the base-line is essentially level, until the next auricular systole occurs. One should now reread this paragraph, at the same time examining Figure 1, representing a normal electrocardiogram. It will be noted that the P, R and T waves are upright while the Q and S deflections (when present) are inverted. Frequently the T wave in the third lead is inverted, without being considered abnormal. The difficulty of distinguishing the three components of the QRS complex may be avoided, by saying that the main QRS deflection is upward or downward, as the case may be.

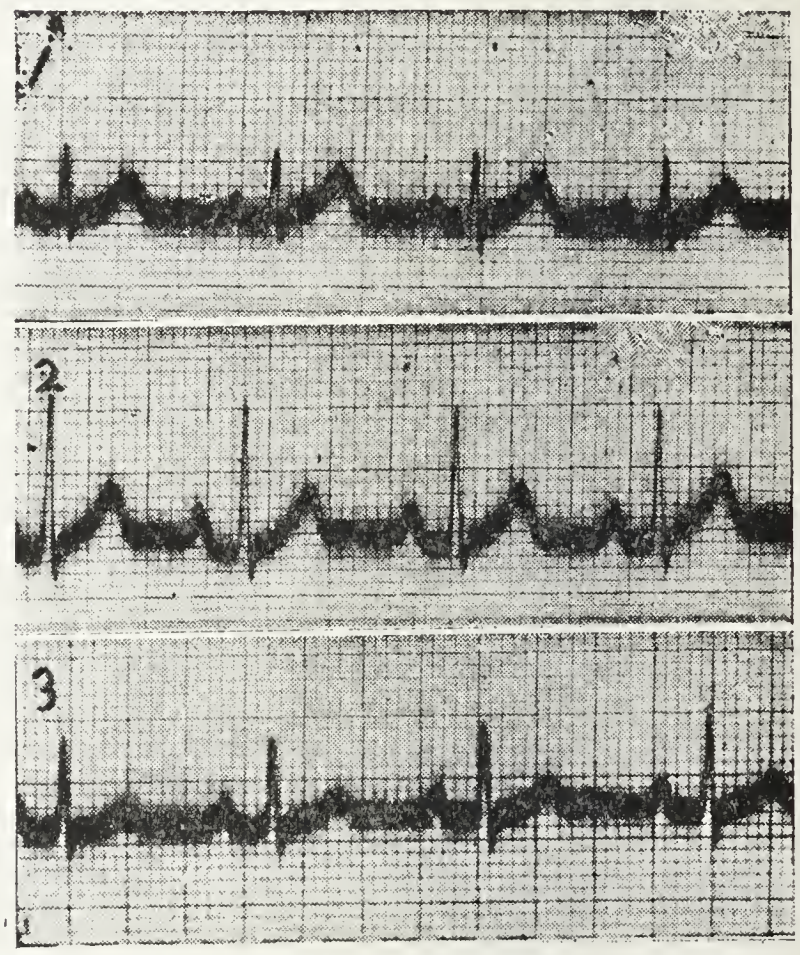

FIGURE 1—The three leads of a normal Electrocardiogram.

All the above mentioned points are significant, and the student should master them before proceeding with the study of abnormal electrocardiograms. In analyzing any electrocardiogram a definite routine should be followed. In this simple manner no abnormality will be overlooked.

The first procedure is to count the rate, for it is of great importance to know if it is within normal limits. The second consideration is to observe the regularity or lack of regularity of rhythm. These two points are mentioned first because they are so often overlooked by the student. After that,

the P waves should be examined, and then the "P-R interval" which is the time from the commencement of the P wave to the commencement of the QRS complex. This should not be over one-fifth of a second. Next the QRS complexes should be examined, in respect to direction, height, and width. The total QRS complex should not last longer than one tenth of a second, and if it is longer in duration than twelve hundredths of one second a very definite abnormality is present. The R-T segment should now be examined to determine whether or not it deviates from the base-line. Finally the size and direction of the T waves should be noted. The time interval by which the T wave follows the QRS complex does not seem of importance. Occasionally after the T wave, a U wave may appear; this is likewise unimportant.

For many years after the introduction of electrocardiography, its chief value lay in the study of cardiac arrhythmias. In recent years it has proved invaluable in the detection of myocardial disease, particularly so in the diagnosis of myocardial infarction. Instead of searching each tracing encountered with view to detecting certain premeditated abnormalities, analysis along the above mentioned lines is much more helpful; and on this account, the description of abnormalities which constitutes the remainder of this article, will follow the above general order.

1. *The Heart Rate*: This should ordinarily be between fifty and ninety. If below fifty, one must think of sinus bradycardia, partial heart block and complete heart block (see below). If above ninety, one must decide between sinus tachycardia, paroxysmal tachycardia (either auricular or ventricular) auricular flutter and auricular fibrillation (see below).

2. *The Heart Rhythm*: The least important arrhythmia is sinus arrhythmia, an irregularity dependent upon the phase of respiration, or in any case being cyclic in type. Very common is arrhythmia due to extrasystoles (premature beats), either of auricular or ventricular origin. Irregularity may be due to partial heart block. In auricular flutter the heart beat is usually regular, but not always so. The most complete type of irregularity is that associated with auricular fibrillation. Other points in the electrocardiographic examination, mentioned below, will decide which type of irregularity is present. The question of heart disease is, of course, not dependent upon the finding of an irregularity.

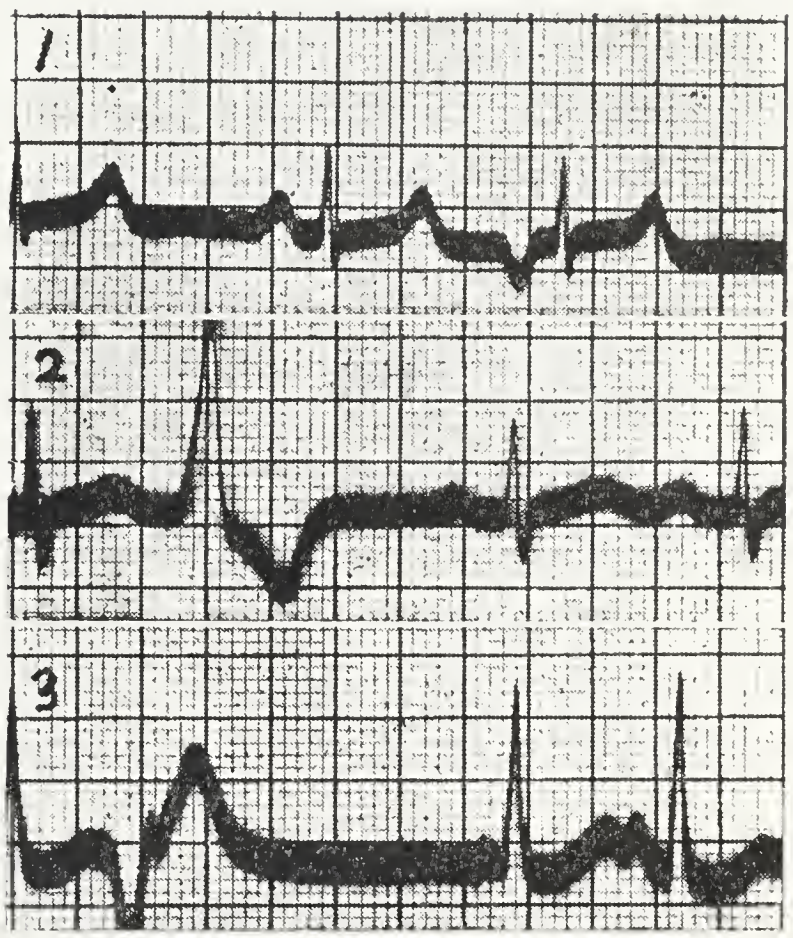

FIGURE 2—Single leads from three cases with extrasystoles. The first shows an auricular premature beat, recorded as an inverted P wave followed by a normal QRS-T complex. The second shows a ventricular Extrasystole—note the compensatory pause which follows. The third tracing shows a ventricular extrasystole, then a normal beat, followed by an auricular extrasystole.

3. *The P Wave*: This is usually upright in all leads. Inversion of the P wave in the third lead is not significant as a rule. If the P wave is inverted in leads one or two, it means that an abnormal pacemaker has supplanted the S-A Node. If an occasional P wave occurs prematurely, it indicates an auricular extrasystole (Figure 2). Such P waves are frequently bizarre in their appearance, but they will be followed

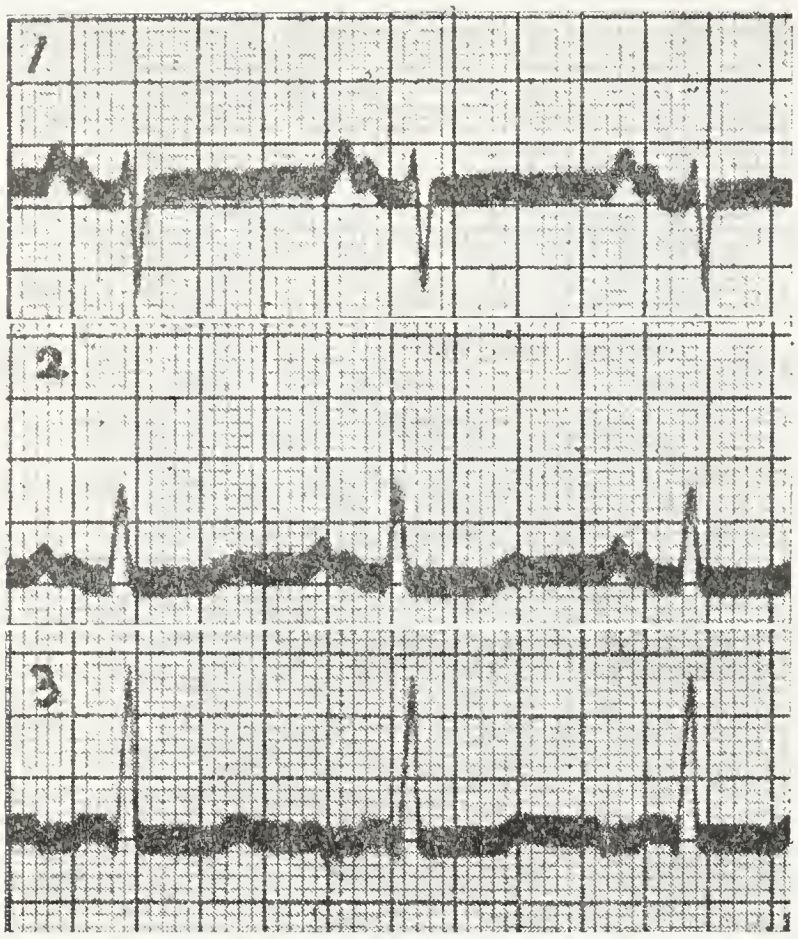

FIGURE 3—The three leads from a patient with Mitral Stenosis. The P waves in Leads I and II are wide and notched. Right axis deviation is present.

(usually) by a normal QRS complex. When a rapid series of successive premature P waves (each followed by a QRS complex) occurs, we have a paroxysm of auricular tachycardia. Such may persist from a few seconds to several days. Practically, auricular extrasystoles and paroxysmal auricular tachycardia are unimportant, unless other evidence of heart disease be demonstrated. Sometimes, in an otherwise normal tracing an entire heart beat will be missing, as shown by an absent P-QRS-T complex; this is termed sino-auricular block and indicates an omission on the part of the pacemaker, but is not usually important. Another point of interest is that in mitral stenosis the P wave in the second lead is frequently large in size and is often notched, (Figure 3). In two important abnormalities, P waves are entirely missing in the electrocardiogram. The first of these is auricular flutter. In this disorder the P waves are replaced by regularly recurring "flutter waves," at the rate of about 300 per minute. Rarely can the ventricle respond to these rapid impulses, so that the ventricular rate is frequently one-half or one-quarter of the auricular rate. Such a tracing is shown in Figure 4; and when once seen, an electrocardiogram of auricular flutter is unlikely to be confused with anything else. The auricular waves in flutter are usually large and of distinctive appearance in the second and third leads, but may be almost invisible in the first lead. The second abnormality in which P waves are entirely absent in the electrocardiogram is auricular fibrillation (Figure 5), a condition much more frequent and important than flutter. Here, the P waves are replaced by rapid small irregular variations in the baseline, which occur about 450 times per minute. Sometimes these small waves are invisible; usually they are seen in some portion of at least one of the leads. The ventricle responds poorly to these rapid irregular impulses, and in a completely irregular manner. The form of the ventricular complexes is not however unusual. The absence of P waves, the occasional appearance in the tracing of varying fibrillary waves,

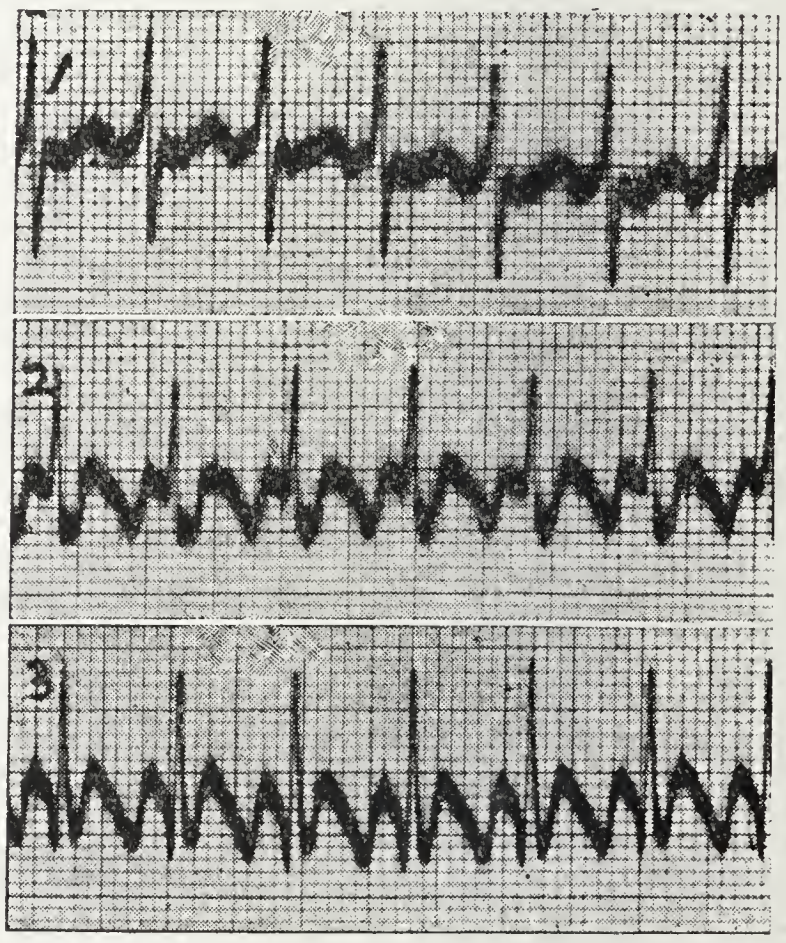

FIGURE 4—The three leads from an electrocardiogram showing auricular flutter, with a 2:1 ventricular response. Auricular rate 340, ventricular rate 170.

and the absolute irregularity of the timing of the ventricular complexes makes the diagnosis of auricular fibrillation certain.

4. *The P-R Interval*: As already stated the P-R interval should not be greater than one-fifth of a second. Where it is prolonged beyond this time, it indicates a delay in the passage of the impulse from auricles to ventricles. This condition of delayed conduction is considered to be the first stage of partial heart block (Figure 6). In it each auricular beat is followed by a ventricular response, but the latter is abnormally, but uniformly late, in appearing. In the second stage of partial heart block, successive P-R intervals tend to increase in length, until a point is reached at which a particular auricular contraction is not followed by a ventricular response at all. A missed beat results, and in the electrocardiogram an isolated P wave is found. The third stage of partial heart block is where such missed beats are a regular occurrence. For instance, for each three

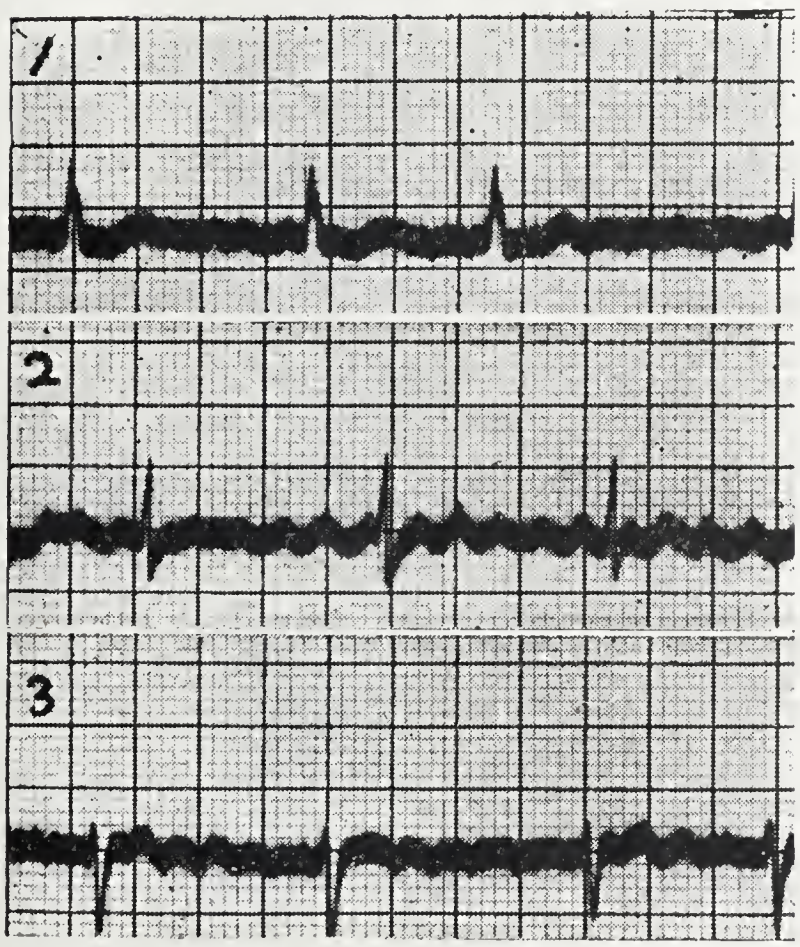

FIGURE 5—The three leads in a case of auricular fibrillation. The ventricular rhythm is completely irregular. P waves are absent, and are replaced by rapid fibrillary waves. Left axis deviation is also present in this electrocardiogram.

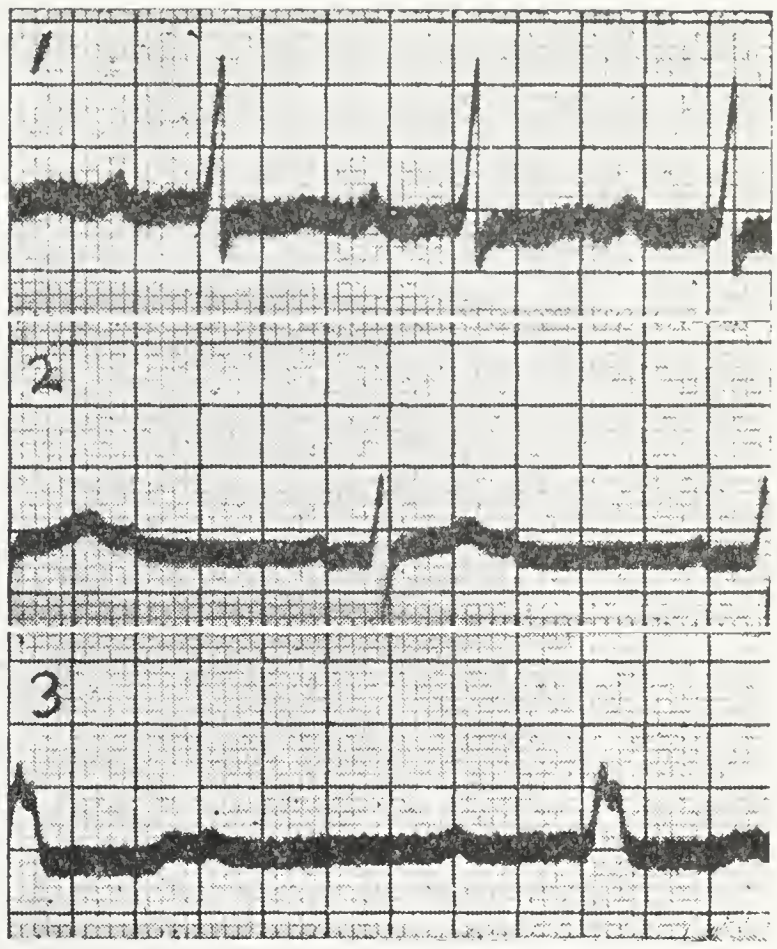

FIGURE 6—Single leads from three cases of heart block. The first shows delayed conduction, the P-R interval measuring about 0.32 seconds. The second shows 2:1 partial heart block—note the P wave immediately after each T wave. The third shows complete heart block and bundle branch block. The auricular rate is 75, and the ventricular rate 33. In searching for complete heart block a much longer strip should be examined than it has been possible to show above.

P waves, only two QRS-T complexes might appear. This would be termed 3:2 partial heart block. Similarly 2:1 partial heart block would be diagnosed if a ventricular response was recorded only after each second auricular beat. Partial heart block may or may not be of serious consequence. On this point some text book such as Lewis' "Clinical Disorders of the Heart Beat," should be consulted. At times complete dissociation between auricles and ventricles occurs. This is termed complete heart block. Fortunately the ventricle takes on a rhythmic beat of its own, usually at a rate of about 30 per minute. Such an electrocardiogram commonly shows a regular succession of P waves at a rate of say 70, with regular QRS-T complexes at a rate of say 30, with no demonstrable

relationship between auricular and ventricular complexes.

5 *The QRS Complex*: In the normal electrocardiogram, the main deflection of the QRS complex is upright in all three leads. In many tracings this is true of the first lead, but in the third lead the main deflection is downwards. This is termed left axis deviation (Figure 5), (formerly called left ventricular preponderance), and is frequently found where the left ventricle is enlarged due to hypertension or aortic valvular disease, and also in normal hearts whose position in the chest approaches the horizontal, as with abdominal obesity and a high position of the diaphragm. Less frequently we find tracings with the main portion of the QRS complex directed downwards in the first lead, and upright in the third lead. This is termed right axis deviation (Figure 3) (formerly, right ventricular preponderance). This occurs where there is relative hypertrophy of the right ventricle, as in mitral stenosis and some types of congenital heart disease, and also in normal hearts, whose position is low and central in individuals with deep chests. In occasional tracings it is found that the maximum deflection of the QRS complex from the base line in any lead, is less than five millimetres. This condition is termed low voltage, and may indicate myocardial damage, though not necessarily so A fairly common and very important QRS disturbance is that known as Bundle Branch Block (Figure 7), inferring block in one of the main branches of the Bundle of His. In this abnormality the QRS complexes are all widened to twelve hundredths of a second or more, and notching and slurring of the complexes are present. In addition, the direction of the QRS complexes in leads one and three is opposite, and the T waves in these leads are also opposite to the main QRS deflections. Such tracings are mainly found in older people with myocardial degeneration resulting from disease of the coronary arteries. Of equal significance are other types of intraventricular block; in all of these tracings the essential feature is a widening of the QRS complexes of the degree above indicated. Mention should next be made of the relatively unimportant ventricular extrasystole (Figure 2). These are easy to recognize in the electrocardiogram, since they consist of premature bizarre ventricular complexes. The individual QRS-T looks much like the complex described under Bundle Branch Block, but it is always premature and not preceded by a P wave. Rarely one sees a tracing in which a series of ventricular extrasystoles occur in rapid succession (about 180 per minute), and this constitutes a paroxysm of ventricular trachycardia. The latter is usually of serious significance, but often responds to prompt treatment by quinidine.

6 *The R-T Segment and T Wave*: These are discussed together because of the significant changes occurring in them after coronary thrombosis. These changes are due to alteration in the heart muscle, and not to the thrombosis

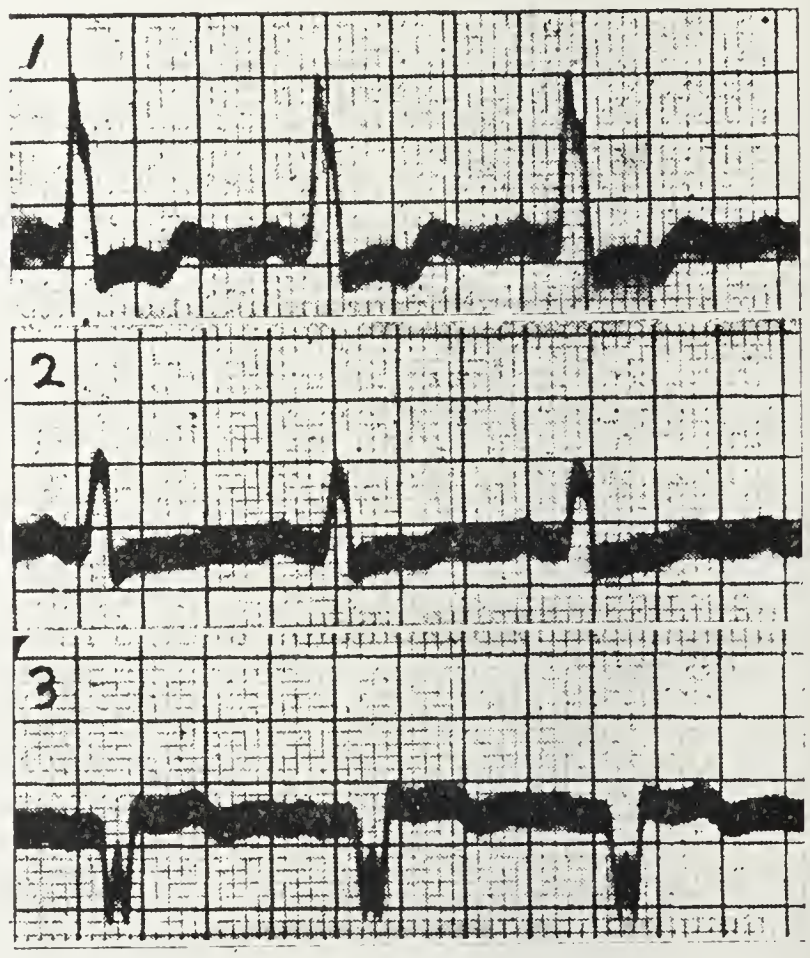

FIGURE 7—Bundle Branch Block. The QRS complexes are widened to about twelve hundredths of a second, and they are notched and slurred. They are in opposite directions in leads 1 and 3, and the T waves are in opposite directions to the main QRS complexes in these leads.

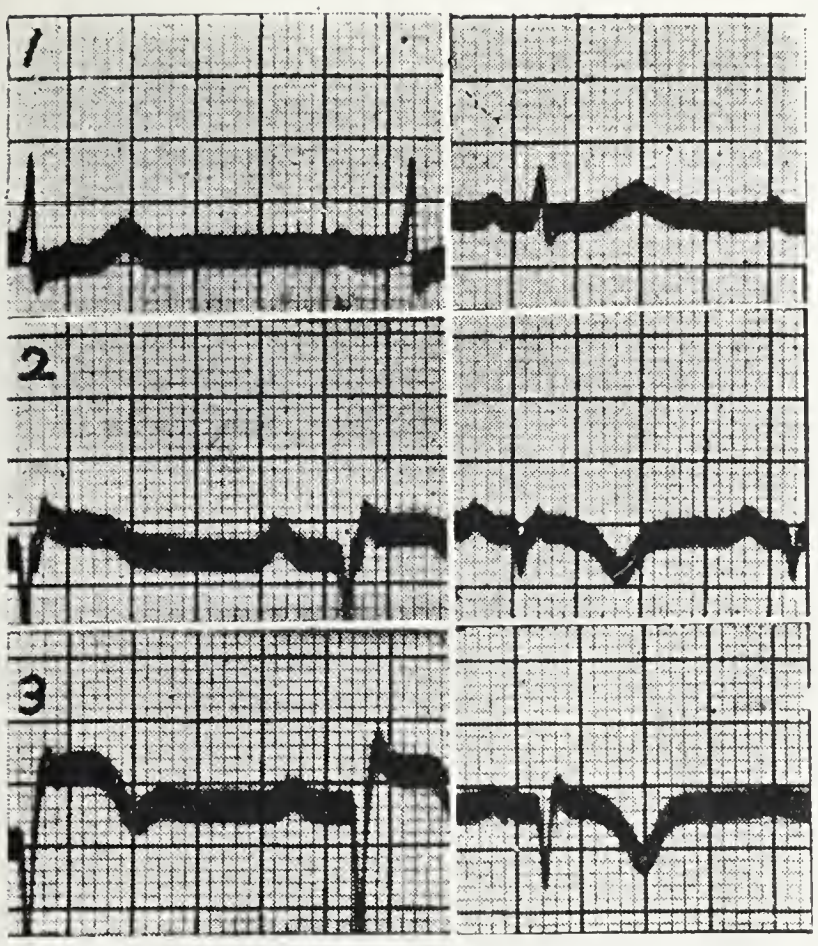

FIGURE 8—Electrocardiograms following coronary thrombosis. Leads 1, 2, and 3, on the left, were taken 24 hours after the attack. Note the low take-off of the RT segment in lead 1, and the high take-off in leads 2 and 3. Leads 1, 2, and 3, on the right are from the same patient, ten days later. The RT segment has returned to the baseline, and marked T waves have appeared in a direction opposite to the original RT segment deviation.

itself. In a typical case, a few hours after the attack, one finds in the first lead either a raising or lowering of the R-T segment (sometimes called the S-T segment) of the base line, and referred to as a high or low take-off from the QRS complex (Figure 8). In the third lead the take-off will be in the opposite direction to that found in the first lead. Usually the T wave is included in this strikingly altered portion of the tracing. In a very few days the raised or lowered RT segment again approaches the base line and a T wave appears, opposite in direction to the original RT takeoff. Over a period of weeks this T wave becomes either sharply inverted, or sharply upright as the case may be. It may persist as such, or the tracing may eventually return to the appearance prior to coronary thrombosis. These changes were first described by Pardee, and are diagnostic of coronary occlusion with myocardial infarction. In many cases of coronary thrombosis, less spectacular changes are found; some times the electrocardiogram shows no significant changes whatever. One should bear in mind that digitalis administration frequently affects the R-T portion of the electrocardiogram, causing a spoon-shaped depression in one or more leads (Figure 9). This must not be confused with changes due to infarction. For many years negative T waves in lead two have been known to be associated with a grave prognosis. The changes in lead two tend to follow those in lead three, and the adverse outlook in these cases is frequently due to the occurrence of a previous coronary thrombosis. Tracings in which the T waves are insignificantly small in all leads are also viewed with suspicion. While serial changes as above mentioned are necessary to the electrocardiographic diagnosis of coronary thrombosis, one may be suspicious that such has prev-

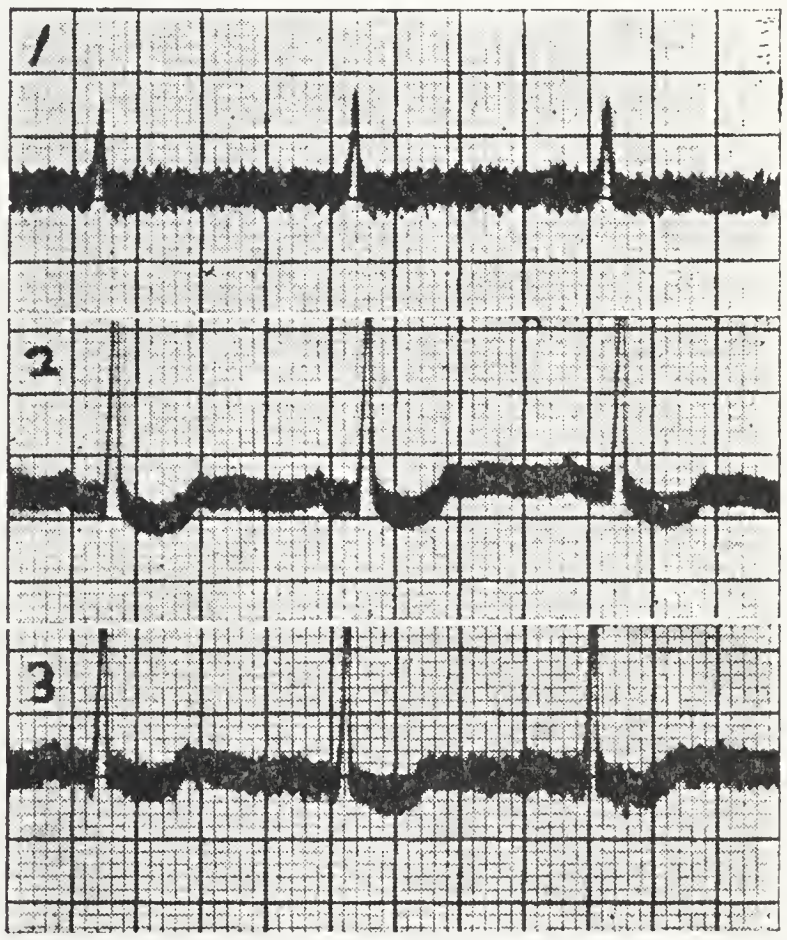

FIGURE 9—Leads 1, 2, and 3, from a patient receiving digitalis. Note the spoon-shaped depression of the RT segments in leads 2 and 3. The T waves have practically disappeared into this depression.

iously occurred in patients whose electrocardiogram shows a very deeply inverted T wave in either the first or third lead.

The fourth lead, mentioned early in this article, frequently shows changes similar to those appearing in lead three, after coronary occlusion. Occasionally diagnostic changes occur in the fourth lead without being evident in the three conventional leads, and in this lies the main reason for its inclusion in the modern electrocardiogram.

Space does not permit the discussion of rarer abnormalities such as nodal rhythm, ventricular escape, etc. However several excellent texts dealing with electrocardiography are readily available for those interested. More than enough has already been said for the average medical student, and my wish is to stimulate interest and thought, rather than to exhaust the details of the subject.

Electrocardiography has a definite place in the study of heart disease. It will never serve to replace a careful clinical examination. In an occasional tracing, a clinical diagnosis is suggested. Such may be the case in tracings following coronary thrombosis. Also, mitral stenosis is most probably present when right axis deviation and auricular fibrillation jointly appear in the electrocardiogram, because of the frequency with which each is met in mitral stenosis. Ordinarily, however, the electrocardiogram must be viewed merely as an adjunct to the cardiac examination. Any opinion based on the electrocardiogram alone is not only unwise but uncertain. While serious electrocardiographic findings are nearly always significant, normal electrocardiograms are not infrequently found in patients with advanced cardiac disease.

In 1938, committees of the American Heart Association and the Cardiac Society of Great Britain and Ireland, announced their joint recommendations regarding the standardization of precordial leads. It was suggested that for ordinary routine purposes, the electrodes be placed upon the outer border of the apex beat, and upon the left leg. These were to be connected to the galvanometer in such a way that the QRS complex in the normal subject, consisted of an initial upward deflection followed by a downward deflection, the T wave being upright. Such is accomplished if the Lead Selector is left at position 3, and the left leg Electrode is used precordially, and the left arm electrode placed on the left leg.

The precordial, or Fourth lead thus recorded is known as Lead IV F, to distinguish it from several other less popular chest leads. In it, the complexes are opposite in direction to those recorded by the method formerly recommended, and referred to in the third last paragraph of the above reprint. The *modern* fourth lead therefore shows changes in the RT segment and T wave after myocardial infarction, resembling those of Lead 1, and opposite to those of Lead 3.

After coronary thrombosis, the fourth lead alone may show Pardee's Sign; or may show it more definitely than the conventional leads. Also, where the infarct is so placed as to give an initial elevation of the RT segment in Lead 1, the absence of the R wave (initial QRS deflection) in Lead 4, is of particular significance, and such absence may persist indefinitely, as an indication of previous infarction.

(February 1945.)

BLAST INJURY

W. R. HARRIS

Part I

Introduction.

The bombing of cities during this war has brought a relatively new injury into prominence. This is caused by the blast effects of aerial bombs, which produce haemorrhagic lesions in the C.N.S., lungs, and G.I. tract, as well as other evidences of trauma such as ruptured ear drums and certain changes in the eyes. Early in the war it became apparent that the lung changes were by far the most important and the most serious, as well as being unique in that they could occur without any evidence of external injury. To these the term Blast Injury was given. As the Battle of the Atlantic developed it was recognized that under-water explosions gave rise to similiar lesions in the lungs and gastro-intestinal tract, and these should be included in a discussion of blast injuries. In this section of the paper I proposed to discuss the aetiology and pathology of the pulmonary and intestinal lesions caused by explosions both in air and in water.

It is difficult for one who has not seen it to realize the tremendous power of explosion blast. Some idea of its force is gained by the realization that buildings can be demolished by it at a range where the actual fragments of the bomb would be relatively ineffective. The effects of underwater explosion are perhaps more generally realized, for all of us have seen moving pictures of depth charges going off, and remember the preliminary dome of water which is shortly dissolved in the gigantic geyser of spray formed by expanding gases.

Aetiology

Either type of explosion can cause lesions in the lungs or in the gastro-intestinal tract. These lesions are basically similar in each case, and consist of a haemorrhagic disturbance of the lungs, which is more common in air blast, and haemorrhage and perforation in the intestine, which is more prominent in water blast. However the method by which the lesions are produced in each type of explosion is distinctly different, and for this reason the etiology will be discussed under the headings of air and water blast.

(1) Air Blast

(a) Physics of Air Blast.

The detonation in air of an explosive produces and enormous expansion of gas which forms a compression shell expanding outwards in all directions from the explosion centre. This expanding shell, travelling in an atmosphere of low specific gravity such as air, reaches its maximum almost instantaneously, and moves away at extreme velocity. The base of the wave however, moves more slowly than its crest, so that the wave breaks and is continually loosing amplitude, resembling a sound wave. The amplitude and force of this wave drops at a rate inversely proportional to the square of its distance from the explosion centre. Therefore the lethal range is short, and if men were stationed at slightly different intervals from the explosion, there would be only a slight distance between the last man killed and the first man uninjured. This would indicate that non-

fatal blast injuries are uncommon. This is known to be true for small bombs, with larger ones other effects may come into play.

This initial or compression wave is shortly followed by a secondary or suction wave caused when the air particles fall back into position after the compression wave has passed. It is of short duration, and never exceeds 15 lbs per sq. inch, which represents a complete vacuum. The negative wave has a high amplitude, because it starts from the peak of the compression wave, but it is relatively slow in reaching its maximum effect.

These positive and negative waves follow every explosion occurring in the air. Essentially they are a form of longitudinal wave motion, i.e., the air particles oscillate back and forth longitudinally about a point, and produce areas of compression and rarefaction.

These two components of blast wave are followed by a third, which occurs after the explosion has taken place. This is the "windage effect", and is quite distinct from the compression wave, being due to hydro-static pressure. The windage is the shattering component, and produces the weird effects on buildings seen after a bombing raid.

Blast waves resemble other forms of wave motion only in that they are reflected from a resistant surface. They have unique properties of their own: for being of unequal front, people at equal distances are subjected to different degrees of blast. The waves are deflected upwards by hot air, as well as by the formation of a crater by the penetration of the bomb. This is significant for it indicates that a person very close to the explosion will escape unharmed, for the blast wave will pass over his head.

(*b*) *Pathogeneses of Air Blast.*

We have seen that Blast Injury as originally defined referred to lesions confined to the lungs. The problem now arises as to how the detonation of an explosive in the air can bring about these lesions. In the investigation of the problem, three possibilities were considered.

(1) *Blast waves entered the mouth and air passages, causing a sudden rise in air pressure in the lungs, leading to rupture of alveoli and capillaries.*

(2) *The suction compoment of blast waves entered the lungs in a similar manner and caused collapse of the alveoli and capillary rupture.*

(3) *The sudden and violent impact of the blast wave on the elastic chest wall causes it to be driven into the lungs, and this impaction is the cause of the haemorrhagic lesions.*

That the latter was the true cause of the lungs lesions was (conclusively) proved by Zuckerman and his associates in an interesting series of experiments, in which various types of animals were exposed to the blast of high explosive as well as to the blast of Hydrogen and oxygen mixtures in rubber balloons. This latter expedient was designed to eliminate possible confusion arising from external injury. The animals were examined immediately after the explosion, both clinically and at post mortem. Zuckerman drew the following conclusions from his experiments:

(1) *There is a definite critical distance of the animal from the explosion for death to occur, and a critical distance for injury. This distance varies with the size of the explosive charge and the species of animal.*

(2) *There is no external evidence of injury in those animals that were killed.*

(3) *The outstanding lesion was bilateral traumatic haemorrhage to the lungs, its extent inversely proportional to the animals distance from the explosion.*

(4) *Animals exposed side-on to the blast had unilateral lesions, occurring on the side nearest the blast.*

(5) *Maximal lesions in the costo-mediastinal and phrenico-costal sinuses suggested an external blow.*

(6) *Animals whose thoraces were completely or partly protected by rubber or plaster jackets had no lesions.*

(7) *Exposure of an animal head-on to the blast minimized the pulmonary lesions.*

Zuckerman emphasizes the fact that the occurrence of unilateral lesions eliminates the possibility of either the positive or negative waves acting through the air-passages, for if this occurred, one would expect the lesions to be bilateral in every case, regardless of the animal's position in relation to the blast.

These experimental conclusions are given further weight by the large volume of clinico-pathological evidence collected by numerous workers. The findings in humans may be briefly summarized as follows:

(1) *Most of the lesions, and all of the severe lesions are beneath the pleural surface.*

(2) *The haemorrhagic areas roughly correspond to the overlying ribs.*

(3) *The depth of the damage is proportional to the degree of blast.*

(4) *The microscopic examination shows no evidence of rupture or collapse of the alveoli such as one would expect if the injury was due to the pressure of suction waves passing through the mouth and air passages.*

Osborne offers an interesting explanation for the deep massive capillary haemorrhages so often seen in humans. He suggests the external compression of the blast wave on the chest wall is supplemented by the counter pressure of air in the alveoli caused by the instinctive closing of the glottis. In infants and animals in whom the glottis reflex is absent, the maximal lesions are subpeural, and rib markings are more prominent. Another factor in the production of lung-blast injuries is suggested by the high incidence in the severe cases of lesions in the phrenico-costal sinus. Osborne claims that in these cases the effect of the blast wave on the chest wall is increased by pressure on the abdomen, with resultant transmission upwards through the diaphragm to the lung base.

Latner devised a method of exposing mice to an extremely low pressure for a period of time equivalent to the suction phase of blast. In this experiment half the animals died instanteously, and at post-mortem exhibited lesions indistinguishable from those of blast. Latner concluded that the damage occurred not as a result of low pressure causing alveolar collaspe, but that the low extra-pulmonary pressure caused a relatively high pressure within the lungs, with resulting over inflation of the alveoli and capillary tearing. This mechanism acts in combination with the elastic recoil of the thorax occurring at the end of the compression wave. Latner states that there is no opportunity for equalization of intra and extra pulmonary pressure during the short duration of the negative wave because of the nar-

rowness of the upper respiratory passages in mice.

Pathogenesis of Immersion Blast.

(*a*) *Physics*

The physical effects of an underwater explosion differ from those of an explosion in the air in the following respects:

(1) *The initial compression wave is not followed by a wave of mass movement or windage.*

(2) *There is no suction component.*

(3) *The initial speed is the same as in air, i.e.,* 5,000 *f.p.s., but the rate of travel is constant and does not diminish as the explosion centre recedes.*

(4) *The rate of fall of pressure is much slower, and varies directly as the distance from the explosion centre. Therefore pressure effects are felt over a much greater distance.*

The waves of submarine blast conform to the general rules of wave motion. On striking a solid surface they are reflected so that the angle of reflection equals the angle of incidence, and thus a reflected wave may double a wave going in the same direction, or neutralize a wave travelling in the opposite direction. This consideration is of importance when explosives go off in shallow water. Should however the obstruction to the waves be of low density compared with water, and therefore presumable floating, the pressure wave will not be reflected at the surface of that object, but will change from a static pulse into a wave of kinetic energy, and the object will be projected into the air above the water. This effect is seen at the surface of water over an explosion, where the superficial layer disintegrates into a dome of spray because of this change from static to kinetic energy. This dome of spray is of no great height and is visible an appreciable time before the much higher column of water due to escaping gases appears.

Now consider the human body, which has roughly the same density as water. When the pressure wave impinges on the body there will be no reflection, but the pulse will be transmitted through the tissues without displacement, just as if the body were so much water. However when the transmitted pulse encounters an air cavity in the body, e.g. the lungs or a gas-containing portion of bowel, the same phenomenon will occur as has been described above, that is, the wave of pressure will change into a wave of kinetic energy in the layers of tissue lining that cavity and a disruptive effect will occur.

This mechanism has been conclusively proved by the research departments of the Royal Navy and the U.S. Navy. In extensive experiments, in which a wide variety of animals were immersed in water and exposed to under-water explosions, the lesions were confined to the lungs and to those portions of the gastro-intestinal tract containing gas-bubbles. Gill and Hay point out that the predominance of lesions in the pelvic gut and in the lung bases is probably due to the wave striking the soft abdomen and being transmitted downwards to the unyielding bony pelvis and upwards through the diaphragm to the lungs, which are at the same time compressed by the force of the blast on the thorax.

In humans immersion blast injuries are more frequent in the abdomen, this being considered due to the manner in which man swims in water, with only part of his chest submerged, as well as to the fact that most of the victims have a considerable amount of chest protection afforded them by their life jackets.

One case of immersion blast injury to the abdomen has been reported in which it was considered that the lesions were due to the sudden entry of sea water through the anus. This conclusion was based on the operative finding of a perforation, with apparent dilution of the peritoneal contents with sea water, and on the fact that the patient had frequent water stools after his rescue. This possibility seems to be remote when one considers that the normal state of the anal sphincters is contraction.

Pathology.

All blast injuries, whether they occur in the chest or abdomen, are characterized by the absence of any sort of external injury, and the presence of acute symptoms related to the chest or abdomen.

Lungs.

Gross.

In those cases dying immediately after an explosion the lungs present varying areas of haemorrhagic consolidation almost identical to the stage of red hepatization of lobar pneumonia. These areas are commonly, but not necessarily bilateral, and may follow the rib markings. They are most pronounced beneath the visceral pleura, but deeper haemorrhages are present, these invariably have either a gross microscopic communication with the subpleural haemorrhages. The subpleural haemorrhages are most frequent along the anterior margin and costal and posterior surfaces of the lungs. The cut surface shows wide-spread petechiae, with irregular areas of more massive haemorrhage, often confined to the costophrenic portion, producing the appearance termed "blast Infarction" in the X-ray picture. The cut surface may be dry or exude a sero-sanguinous fluid. On palpation the lung has been variously described as having a leathery or wooden feel. The lung floats on water. There are submucous petechiae in the trachea and bronchi, and in the more severe cases the air tubes may be filled with frothy oedematous and frequently blood stained fluid. Blood clots may also be present. Rarely there is emphysema, with subpleural emphysematous bullae more marked along the rib indentations, and more rarely still there may be a laceration of the visceral pleura with a resulting hemothorax or hemopneumothorax. These latter are more commonly due to fractured ribs or external injury.

Cases dying 50-60 hours after injury present a different picture. The haemorrhagic areas are considerably enlarged, and are divided into a central dark red-zone, like venous blood, and flecked with small grey areas; and a peripheral bright red-zone. The explanation of these changes is given by the microscopic picture.

Microscopic.

The essential microscopic lesion is an intense congestion of the capillaries with the escape of oedema fluid and a varying amount of red blood cells into the alveoli. In the early stage, the alveoli are distended and packed with non-hemolysed bright-staining red blood cells, even in those areas not showng gross haemorrhage. Except in the most severe cases the alveolar ducts and terminal bronchioles are typically air containing and free from haemorrhage. Many alveoli are filled with oedema fluid and fibrin, the result of the intense capillary congestion. There has been no convincing evidence of direct rupture of the alveolar epithelium, although there have been occasional reports of capillary rupture. It is considered more likely that blood corpuscles are freed from the capillary walls by a pro-

cess of diapedesis as in certain inflammatory changes. The frequency of interstitial haemorrhages emphasizes this view.

In those cases dying 50-60 hours after the initial injury, it is found that the central dark red zones are centres of repair of damaged lung tissue. Alveoli are filled with fibrin in which are enmeshed hemolyzed red blood cells and wandering monocytic cells filled with brown pigment like the so-called heart-failure cells. The peripheral bright red zones are alveoli packed with fresh red blood cells, presenting a picture similar to the initial haemorrhage. The nature of this secondary haemorrhage is in doubt, some claim that it is a true late bleeding, and that the extent of the haemorrhagic area is directly proportional to the survival period of the patient, and others that it is an inflammatory reaction to the primary haemorrhage.

Course of Pulmonary Blast Injuries.

(1) *Death.*

The mortality rate is high, because of the sharply delimited lethal range of bomb blast. The cause of death is obscure, in those cases dying instantly it may be due to sudden compression of the thorax causing a sufficiently high back pressure on the venous system to effect the vital centres in the floor of the 4th ventricle. It is unlikely that the degree of pulmonary haemorrhage is sufficient to cause death by shock. In some cases death is due to asphyxia, caused by the presence of blood, mucous, or other exudates in the upper air passages. Rarely death may be due to inhalation of noxious gases e.g., CO, produced by the combustion of explosives. In those cases dying 2 or 3 days after the injury, the cause of death is even more obscure, the clinical picture points to a gradually increasing shock apparently uncontrollable by the ordinary methods.

(2) *Recovery.*

The recovery rate is low. In those cases that do recover, there is no clinical or X-ray evidence of residual damage, and recovery appears to take place by resolution, similar to lobar pneumonia.

(3) *Infection.*

Several workers report infection occurring in the damaged areas, but this does not seem as common as one would expect considering the extent of the initial lesion. Such infection is apparently fairly well controlled by exhibition of sulphonamides.

(*b*) *Abdominal Blast Injuries.*

Under water explosion causes lesions in the chest and abdomen. The chest lesions are identical with those of air blast and need not be discussed further. The abdominal lesions fall into two categories: haemorrhage and perforation.

(1) Haemorrhage.

Three types of haemorrhage occur: submucosal, subserosal and mesenteric.

(*a*) *Submucosal.*

This may range from scattered petechiae to well defined annular rings of haemorrhage surrounding the wall of the gut, in which case the adjacent lumen is filled with a large blood clot. Frequently these haemorrhages may be seen to penetrate the muscular portion of the gut wall.

Microscopically the degree of haemorrhage ranges from small groups of red blood cells between the gland outlets, the epithelium having become completely or partially detached, to larger effusions of red blood cells down to the muscularis where it abruptly stops, with some evidence of surrounding tissue necrosis.

There is a generalized scattering of epithelial cells, and large superficial flakes of these may be discerned in blood oozing from the raw surface layers.

(*b*) *Subserosal.*

Subserosal haemorrhages again may range from scattered petechiae to larger effusions, which tend to form hematomata rather than penetrate the wall of the gut.

(*c*) *Mesenteric.*

Mesenteric haemorrhages are very common, and almost are hematomas. Rupture of mesenteric vessels may be seen both in the gross and microscopically. There have been no reports of actual tearing of the mesentery.

(2) Perforation.

Perforation occurs in approximately 50% of cases suffering from abdominal symptoms, and in about 60% of experimental animals.

Perforation is more frequent in the large bowel, and this may be attributed to the greater amount of gas in this part of the G.I. tract. In the large bowel, perforation occurs along the long axis, because of the inherant muscle weakness in this direction. Perforation elsewhere is usually transverse. Perforation apparently occurs from within outwards, the margins of the perforation are everted and frequently there is prolapse of the mucosa through the opening.

Microscopically all layers of the gut wall are fragmented and perforated apparently from within. Apposing edges are heavily infiltrated with leucocytes, lymphocytes and plasma cells, and there is considerable superficial necrosis as well as a striking fragmentation of smooth muscle fibres. The adjacent serosa bears heavy deposits of exudate. There is compartively little regeneration or attempts at tissue prolifertion about the perforation.

Occasionally in animal experiments rupture of the liver or spleen has been reported, but damage to these organs as well as to the kidneys is unusual on account of their protected position. In certain experimental animals, such as monkeys, haemorrhages were observed beneath the tunica albigens of the testicle.

The most significant contribution to the nature of perforation in immersion blast injuries has been made by the British workers, who pointed out that two types of perforation could occur: (1) Early or traumatic, the immediate result of the explosion. (2) Late, occurring some time after the initial injury as a result of necrosis and subsequent infection of the bowel wall following haemorrhage into its muscle layers. It is possible that actual digestion of the gut wall may occur. The process eats its way through the necrotic area, and suddenly bursts through into the pertoneal cavity much as a perforating appendix.

American workers claim that perforation is always the immediate result of the explosion, but there is such a mass of clinical evidence to support the existence of late perforation that it is difficult to accept this view.

Course of Abdominal Blast Injuries.

(1) *Death.*

Instantaneous death is not as frequent as in the case of air blast. When it does occur it may be the result of concurrent blast injury to the chest, or to what has been loosely described as a "Gross Splanchnic Insult" to the abdomen with clinical evidence of profound shock, associated with ruptured viscera and massive internal haemorrhage.

Late death is apparently entirely due to

generalized peritonitis, the result of perforation.

(2) *Abscess formation.*

Abscess formation is fairly frequent, and bears a low mortality rate. This lends support to the theory that perforation can occur through gut wall previously damaged by haemorrhages, because the slow development of infection by this process enables walling off to occur.

(3) *Recovery.*

A considerable proportion (approx. 60%) of cases recover, with no residual defects. These do not come to operation, and hence opportunities of observing their lesions are limited. However they present the typical picture of the "acute" abdomen, and it is believed that the signs and symptoms are due to rupture of the mesenteric blood vessels with resultant mesenteric hematomata.

SUMMARY

To sum up the detonation of high explosive in air or water produces pulmonary and abdominal lesions in human beings that are characterized by the absence of any sign of external injury.

The chest lesions are caused by the sudden violent impact of the compression component of the blast wave on the chest wall. The characteristic lesion is an intense dilatation of the pulmonary capillaries with the escape of oedema fluid and varying amounts of red blood cells into the alveoli, producing a gross appearance indistinguishable from the stage of red hepatization in lobar pneumonia. The cause of death is obscure, it is most likely due to compression effects on vital centres in the floor of the 4th ventricle, or to shock resulting from the extensive haemorrhages.

Abdominal lesions are caused by sudden conversion of blast wave energy to knetic energy on meeting a gas filled portion of the bowel; with resulting tearing effect on the bowel wall. The characteristic lesions are submucous, subserosal and mesenteric haemorrhages, and perforation of the gut wall. Haemorrhage into the muscular layers of the bowel wall causes necrosis with subsequent infection leading to perforation some days after the initial injury. Death occurring early is due to shock caused by extensive internal haemorrhage or to concurrent blast. Late death is the result of perforation and generalized peritonitis.

PART II Dealing with the clinical aspect of Blast Injuries, will appear in next months issue.

Ed.

Features

C. A. F. MOES, Editor

FINANCIAL REPORT OF MEDICAL SOCIETY 1944-45

STATEMENT OF RECEIPTS AND DISBURSEMENTS

FOR THE PERIOD OCTOBER 1, 1943, TO OCTOBER 12, 1944

RECEIPTS

Cash in the Canadian Bank of Commerce, Oct. 1, 1943	$ 57.90
Fees from the Bursar for the above period	2,659.00
Receipts from the At-Home ticket sales	914.45
Receipts from the A. and L. banquet ticket sales	303.00
Receipts from the I.S.S. Drive	450.17
Returned cash from the Grad Banquet Committee	50.56
Returned cash from the Soph-Frosh Committee, 1941	5.00
Payment of debt from Mr. Fitzgerald	15.20
	$4,455.28

DISBURSEMENTS

Medical Women's Undergraduate Society	$ 140.00
At-Home Committee	564.32
Medical Athletic Society	935.00
Medical Journal	625.00
Medical Arts and Letters Club	200.00
Christmas presents to the staff	43.00
Ashley and Crippen	152.50
Arts and Letters Banquet	360.05
Trip expenses for Society, C.A.M.S.I. Executive	91.00
Students' Administrative Council	45.00
C.A.M.S.I.	402.08
Graduation Banquet Committee	80.00
I.S.S. Drive total	450.17
Election expenses	33.77
Permanent Executive 4T4	30.00
Birks-Ellis-Ryrie	89.78
Royal York Hotel (At-Home Committee '44)	60.00
Sundry disbursements (see list)	83.26
	$4,384.93

SUNDRIES

Lois Craig (fees)	$10.00
Flowers (Dr. Wasteneys)	3.00
Flowers (St. Hilda's)	5.00
Broken records	1.50
Laundry	2.00
Medical Float (I.S.S.)	11.05
Phone bill	9.00
Ruth Allbright (fees)	28.00

Cash on hand in the Canadian Bank of Commerce Oct. 13, 1944—$70.35

John Willford (printed sheets)	4.50
H. Barnett (candy)	1.20
U. of T. Press (dance tickets)	5.54
Stamps	2.47
Total	$83.26

Receipts:

Balance in the bank, Oct. 1, 1943	$ 57.90
Receipts, Oct. 1, 1943, to Oct. 12, 1944	4,397.38
Total	$4,455.28

Payments

Oct. 1, 1943, to Oct. 12, 1944	$4,384.93
Balance on hand Oct. 12, 1944	70.35
	$4,455.28

Reconciliation with bank statement:

Balance in bank Oct. 12, 1944	$ 110.35
Outstanding cheque No. 60 (S.A.C.)	40.00
Balance on hand Oct. 12, 1944	$ 70.35

MEDICAL ATHLETICS

Medical Athletic Director, Joe Fyfe

In taking office as president of the Medical Athletic Association, I would like to pay tribute to my predecessor, Dr. George A. Lewis, who has done such outstanding work for medical as well as university athletics. Thank you, George, for a job well done, and good luck to you!

In looking over the sport results for the winter term, there has been a general lack of interest shown by the medical students. For the first time, we have had teams automatically disqualified from intramural competition because they defaulted two games. Besides, there have been other teams who have defaulted once. On the other hand, some of our teams have done very well; in this group are the Meds. II hockey team, the Meds. Jr. "B" water polo team, the Meds. Jr. "B" basketball team, and the indoor track team.

With regard to the T. A. Reed Trophy race, we are still in second place, twelve hundred points behind Trinity College. If the revised point system goes into effect, our standing should receive a considerable boost. Then if everybody does his share for the remainder of the sports schedule, avoiding defaults, our chance of winning the T. A. Reed Trophy again this year would seem fairly good. Only in this way we will achieve, or at least approach, the goal of the T. A. Reed Trophy, namely, the encouragement of intramural sports throughout the university.

"THE LOST NOTE"

I was seated one day at the bedside,
I was weary and needed rest,
And my fingers wandered idly
Over the patient's chest;
I had mapped out the cardiac dulness,
And was gently percussing the lung,
When I struck one note that resounded
Like a song from an angel's tongue.

It may have been up at the apex,
It may have been down at the base,
But the source of that note that thrilled me
I have never been able to trace;
It wasn't exactly skodaic,
It certainly wasn't dull,
But it fell on my jaded spirit
With a kind of infinite lull.

It wasn't dilated stomach,
For the gastric resonance smote
On my ear like a horrible discord
After this heavenly note;
I don't think 'twas over the sternum,
It can't have been over the spine,
Yet it came from the chest of that patient,
And hit me full in mine.

I've percussed every inch of the patient
In a frenzy of hope and fear,
But that breath of heavenly music
Has never soothed by ear;
I have thumped him with sledge-hammer violence,
I have stroked him with sylph-like touch,
But never again have I heard it—
That note I admired so much.

It may be with some new patient,
It may be in some fresh ward,
I shall strike once more that glorious note
Which my soul will always hoard;
And I know that I shall recall it,
Though I miss each Physical Sign—
That note from the chest of the patient
That hit me full in mine.

So day by day at the bedside
You may see me pursue my quest,
And day by day you may watch me
Percussing some likely chest;
If I perish without having heard it—
That note that I love so well—
I trust I shall hear it in Heaven,
Or forget it for ever in Hell.

R.B.P.—St. Bartholomew's Hospital Journal, Dec., 1908.

ASHLEY & CRIPPEN
PHOTOGRAPHS
196 BLOOR STREET WEST

Abstracts

M. ST. AUBIN, Editor

Contributors

T. Y. Chang — Miss I. D. Moon
D. Gibson — E. Peer
H. Kalant

MEDICINE I

The Combined Use of Penicillin and Heparin in the Treatment of Subacute Bacterial Endocarditis

Leo Loewe, A.B., M.D.
Canadian Medical Journal, Jan. 1945

For some time it has been known that the causative organisms (usually streptococci) of subacute bacterial endocarditis, were protected from any anti-bacterial agent or even any of the normal physiological defences of the body by depositions of fibrin and platelets around them. The mass so formed on what is always previously deformed endocardium, constituted the vegetation, and was the source of the septic emboli which played so conspicuous a part during the course of the disease.

So anti-coagulants were sought in order to enable either or both the defences of the body and chemo-therapeutic agents to get at the offenders. Heparin was tried. It gave excellent promise as long as it was confined to animals, even showing some eroding action on the thrombus, but when it came to be tried on human individuals, by either continuous venoclysis or fractional intravenous injection, it was found to be too dangerous, too expensive, and not sufficiently effective to justify its use in this condition.

Then the department of medicine and the laboratory of the Jewish Hospital, Brooklyn, N.Y., began research on the subject. *First*, they found that heparin did not reduce the potency of penicillin; in fact, they felt they had evidence to suggest some synergism. *Second*, they began a search for the optimum coagulation time, to be used in conjunction with penicillin. This they discovered to be between 30 and 60 minutes (average normal is about 20 minutes). To obtain this, they found that 300 mgms. of heparin absorbed steadily over a period of two days was sufficient. More was apt to be wasteful and might be dangerous. *Third*—the real difficulty, the place where others had failed—they had to find some way of giving the heparin so that a steady, relatively low level would be maintained in the blood, so that the thrombus would be under its influence continuously, and yet so that no toxic manifestations would occur. These workers developed the idea of incorporating the heparin in a viscous or solid solvent to be injected subcutaneously, instead of injecting an aqueous solution intravenously, as had always been done before, they adapted Pitkin's menstruum, which contained gelatin, dextrose, glacial acetic acid, and water. By varying the proportions of these ingredients, the solidity at any temperature, and hence the ease of solubility was varied, and so the rate of heparin absorption could be controlled. The menstruum, made up with these varying proportions, was put up in sterile ampoules, ready to be heated (to

liquify it) and injected subcutaneously. This is the essentially original part of their work.

The emphasis of the experimental work then shifted to the wards. These workers found that the following was the best schedule for treatment:

1. *Test the sensitivity of the organisms.* Broth cultures were inhibited by 0.002 to 0.5 Oxford Units of penicillin. On this was based the daily amount of the drug. In practice this ranged from 40,000 units to 1,000,000 units per day, but, as time went on, they felt that 2,000,000 units a day should be regarded as the minimum when penicillin becomes easily available. As the author, said, "Best clinical results are achieved when the average unitage of penicillin is sufficient to develop and maintain blood serum levels of 5 to 10 times the sensitivity figure. . . . Inadequate dosage invites treatment failure and the organisms may aquire resistence that is so high as to render future therapeutic levels virtually unattainable." This increased resistance was observed to be as high as forty times the original sensitivity figure. No toxic symptoms ever resulted from penicillin, no matter how huge the dose they gave.

2. *For the first few days penicillin was given alone.* This helped to prevent the breaking up of friable vegetations (under the influence of the heparin) and consequent embolism and pyaemia. No case of cerebral emoblism ever developed after this routine was established. The penicillin is given by continuous venoclysis by choice. In cases of congestive heart failure, this is unwise, and so intramuscular injections are resorted to, but the level of penicillin in the blood by this method is very fluctuating, and generally inadequate. As soon as the cardiac cases improve, they are put on continuous penicillin drip, with the least possible fluid, and on a low salt diet. Ringer's solution is prefered as the medium for the penicillin.

3. Then begins the *subcutaneous injection of heparin* in their adaptation of the Pitkin menstruum, *in conjunction with continuous penicillin administration.* They believe that a five week course of treatment is best. If the patient is not cured, it may be repeated as often as necessary.

4. *Any focus of infection was cleared up* after cure of the condition was established, and before the patient left the hospital.

Results were as follows:

1. Minor toxic reactions (from the heparin): chills, fever, local pain, regional angiitis, regional adenopathies, urticaria, vesicular eruptions.
2. Final results: (in 54 entirely unselected, and successive cases, ranging in duration of the condition before treatment was initiated, from one to seventy-eight weeks):

FIRST: Pathologically:

In three patients who died after recovery, the endocardium was restored to as nearly normal as could be expected on the old rheumatic or congenital lesion. Even in the unsuccessful cases, the vegetations showed evidences of melting away; they were organizing, and were practically free of bacteria.

SECOND: Clinically:

14 patients (26%) failure, due to:

a. Patient Factors:

1. cardiac failure, 4 patients (28.5%)

II. cerebral embolism, 3 patients (21.4%)

III. inanition, 1 patients (7.2%)

IV. intercurrent infection, 2 patients (14.3%)

b. Organism refractory, 3 patients (21.4%)

c. Reinfection, 1 patients (7.2%)

So, of the 14 failures, 10 were due to the poor conditions of the patient, and might have been eliminated had the treatment been commenced earlier.

40 patients satisfactory (74%)

.3 subsequently died of other causes. .37 are still alive. Many of them have resumed useful occupations in spite of the cardiac damage which was quite independant of the endocarditis. Some of these cures have been established for as long as a year and a half.

The author says in conclusion, "If the patient is in good physical condition, the duration of the disease less than three months, and the causative organisms sensitive to penicillin, a satisfactory result may be anticipated, barring accidents, in virtually every case". Such optimism concerning the outcome of what has hitherto been one of the most certainly fatal conditions, is astonishing. We shall await confirmation of their results with the greatest interest.

E. P.

MEDICINE II

Reaction of the Meninges to Blood

Ernest M. Hammes, Jr., M.D. *Archives of Neurology and Psychiatry Dec.* 1944.

The reaction of the meninges to blood is one of the important factors in evaluating therapeutic spinal punctures in subarachnoid hemorrhage. The author reviews previous relevant studies and describes the selection and control of the material for his own study—53 cases of intracranial aneurysm who came to necropsy. These were grouped according to the duration of life after the subarachnoid hemorrhage occurred, enabling him to see successive pictures in the microscopic sections and reconstruct the pathological process.

Within 10 minutes the subarachnoid space is filled with red blood cells, especially about the base of the brain. In two or more hours polymorphs appear around the blood vessels of the pia, followed in about two more hours by lymphocytes, both types of cells probably coming from the vessels. These cells increase in number until the next definite change occurs in about twenty-four hours when the mesothelial cells lining the subarachnoid space become swollen and phagocytic, finally breaking away to become free phagocytes. About this time some of the blood cells break down leaving pigment and iron free in the subarachnoid space. By the end of 3 days the phagocyte reaction is still increasing, but the polymorph reaction is at its height, to subside in 3 or 4 more days. By then the phagocytes and lymphocytes are still present, but are also passing their peak of activity. In ten days most cases show a patchy fibrosis in contact with the subarachnoid blood, and binding the arachnoid mater to the pia. Activity of the mesothelial cells and the presence of free phagocytes and lymphocytes persist as long as there is blood or blood breakdown products in the subarachnoid space.

Intracerebral hemorrhage, he comments, is more likely to occur if there has been preceding subarachnoid hemorrhage with subsequent fibrosis or clot organization to deflect the rupturing blood into the brain substance.

From these observations his chief conclusion is that autogenous blood in the

subarachnoid space is not well tolerated by the human leptomeninges, there being the cellular reaction described as long as blood or blood products persist, with fibrosis ensuing after about ten days. This suggests strongly that if it can be done safely, removal of blood by spinal puncture will lessen the severity of meningeal irritation of subarachnoid hemorrhage.

D. A. G.

SURGERY I

Adminstration of Intravenous Fluids to Surgical Patients

Paul F. Fox *American Journal of Surgery Jan.* 1945.

In this article the author tries to summarize the effects of the different intravenous fluids used and to comment on the advantages and disadvantages of each. Since the parenteral administration of fluid is of outstanding importance postoperatively, the knowledge of this subject should be thoroughly known to surgeons. The daily loss of fluid from the body either through the respiratory mechanism, skin, bowel, or kidney from the average surgical patient totals about 2,500 cc and this amount of fluid if it cannot be taken by mouth must be supplied parenterally, usually intravenously. As a measure of the need of intravenous fluids, the hematocrit determination of venous blood, specific gravity of blood and plasma are used.

1. Physiological saline—restores both the fluid and the salt balance of the body. Normal salt requirement is from 5 to 10 grams of salt daily and unless there is an abnormal salt loss do not give more than one litre of normal saline (8.5 gms) daily for fear of precipitating edema.

2. Glucose solution—is valuable in the prevention of ketosis, in cases of liver damage and in supplying water and food in the form of sugar. It may be given in 5% solutions in conjunction with either saline or amino solutions.

3. Blood—as a transfusion mixture is especially valuable where there has been a severe loss of blood with impending shock either due to trauma or surgical operations. Various methods have been devised to enable indirect transfusion of whole blood and the necessity for the meticulous care of glassware and apparatus for transfusion as well as the test for reactions in the blood is stressed.

4. Plasma—is prepared by removing the cellular elements of the blood from the whole blood which has been treated with some anticoagulants as sodium citrate or heparin. Plasma is best used in cases of severe burns hypoproteinemia and shock without hemorrhage. Advantages of plasma are that it can be dried, frozen and stored for a long time but it has the disadvantages of being required in large amounts and only a relatively small volume of plasma can be extracted from a volume of whole blood.

5. Amino Acid Solution—is especially valuable in the prophylaxis and treatment of hypoproteinemia in surgical patients. Amino acid solution is prepared from digestion of casein by pork pancreas and is commonly given in 5% solution with 5% glucose. In this way adequate amounts of the essential amino acids can be supplied to the body at low cost and in direct proportion to the needs. Reactions are few in number although clinical experience with this solution is limited but the indications for its future use are very strong.

6. Gelatin—developed as a result of attempts to find a more economical and less technical method of producing a blood substitute. Infusions with normal saline has been used in place of plasma for cases

of hemoconcentration and the correction of this condition by this means has been attained. The effects are of shorter duration than plasma and the human body can tolerate the infusion comparatively well.

7. Pectin—is considered as another possible blood or plasma substitute and the effect produced is a marked and sustained rise of plasma volume in the normal person. Prepared pectin in the form of a light powder could be redissolved in water or saline and given intravenously to produce a hemodilution effect.

Other fluids have been tried but all these have properties which limits their practical value, hence not as the preceding fluids mentioned.

T. Y. C.

SURGERY II

The Superiority of Penicillin Over Bacteriophage, Sulfathiazole and Certain Other Antibacterial Substances (as Indicated by Experimental Infections in Chick Embryos)

Surgery, Gynecology and Obstetrics, Jan. 1945.

This article describes how the inoculation of the chorioallantoic fluid of ten day old chick embryos with a 0.1 cc of a broth culture of Staphylococcus aureus constantly brought about the death of the embryo within 24 hours.

The injection of Staphylococcus bacteriophage immediately following the inoculation of bacteria prolonged the life of the embryo in all cases. The bacteriophage caused decrease and degeneration of the bacterial growth but never produced complete sterilization, nor a blood stream invasion by the bacteria. The phage actively multiplied in dilutions less than 10^{-5} and usually disappeared in greater dilutions. The addition of creepryn or phemerol did not significantly change the therapeutic results of bacteriophage treatment of the infected embryonated eggs.

The administration of 100 units of penicillin (calcium salt) anytime within six hours following the bacterial inoculation resulted in the survival of the majority of the embryonated eggs for the seven day experimental period and in hatching of eggs when incubation was prolonged beyond this period. A complete sterilization occurred in 76% of all eggs inoculated with 100 units penicillin.

Administration of 28.5 or 57 gr. sulfathiazole failed to prolong life of the embryonated eggs or to produce significant bacterial inhibition of the test dose.

Antistaphylococcus rabbit serum and Staphylococcus antitoxin horse serum produced some prolongation of life of the eggs but the antibacterial effect of these substances was insignificant.

Carboxymethoxylamine proved toxic for embryos, and Vioform had only a slight bacteriostatic effect. The new antibiotic from Bacillus T was not as efficient as penicillin.

The article has shewn conclusively that penicillin is superior in saving the life of chick embryos inoculated with Staphylococcus aureus in doses which killed the controls in 24 hours to Staphylococcus bacteriophage, Staphylococcus antitoxin, vioform, carboxymethoxylamine, sulfathiozole or antibiotics derived from Bacillus T.

It is concluded that penicillin should be replaced by phage only when it fails or is not available.

M. S. A.

SURGERY III

Gas Gangrene in Amphibious Warfare in the Pacific Area

LIEUT. H. B. NEELE & LIEUT. J. P. COLE *American Journal of Surgery Dec.* 1944.

Although rarely encountered in civilian wounds, gas gangrene is still an important complication of battle wounds, occurring in from 0.32% to 3% of all wounds. In this paper, the author reports seven cases in 984 consecutive fresh wounds inflicted during fighting in the South Pacific, an incidence of 0.7%. A brief review is presented of the history and the bacteriology of the infection. The organism, in the great majority of cases is Clostridium welchii in symbiosis possibly with various aerobes. About three quarters of the cases occur in the lower limb, in the large fleshy muscle groups. Most cases are fulminating with extension into all the adjacent soft structures. All cases start in large, deep, irregular flesh wounds, and signs and symptoms appear in one to five days after infliction of the wound—in this series the average was 2.35 days.

The characteristic gross and microscopic pathological pictures are described.

Clinically, pain was the chief early symptom in this group of cases. Local swelling, discoloration, crepitus and profuse blood-stained malodorous discharge were also early signs. In five of the seven cases, fractures were present, and the use of plaster casts in the treatment of these, prevented early diagnosis in some cases. In similar cases the doctor should be alert to detect the earliest onset of local pain under the cast, or any bloody discharge or characteristic odour. The white blood cell counts and the temperature were variable and not in keeping with the gravity of the infection. Pallor and evidence of toxicity were striking but late. Low red blood cell counts and low hemoglobin were the important blood findings.

Prompt and adequate excision of devitalized tissue, and packing the wounds with vaseline gauze is the most important prophylactic measure. In a case of gangrene which has been discovered early, this may still serve as treatment, but most of cases when seen, require amputation of the affected extremity, through healthy tissue, well above the level of the disease process. Local and systemic use of sulfonamides and penicillin at the time of injury, or of treatment, or when disease is established, have little or no value. Polyvalent antigas gangrene serum is probably of some use, if given sufficiently early. The most useful adjunct to surgery, however was found to be multiple transfusions of whole blood, to replace that lost at the time of injury, and by the hemolytic action of Clostridium welchii toxin.

H. K.

SURGERY IV

Slerotherapy of Varicose Veins

E. J. ORBACK, M.D. *American Journal of Surgery Dec.* 1944.

Sclerotherapy of varicose veins, as the author points out, has a very low morbidity, almost no mortality, and no necessity for hospitalization; it is followed however by a recurrence rate as high as 60-78%. When combined with certain surgical procedures, such as high ligation of the saphenous vein, ligation of perforators, and extirpation of very large varicosities. The incidence of recurrence is as low as 10 to 16% as good as, or better than that found with radical operations.

While the sclerosing substance is usu-

ally injected directly into a vein filled with blood, this results in dilution of the sclerosing agent, with a higher rate of recurrence. Therefore it has been found to be better practise to insert the needle, then to empty the vein by elevation of the leg, before injection of the solution.

In many cases, due to the thickened fibrotic incollapsible veins, or to their difficult location, this latter method cannot be employed. To meet these circumstances, the author offers a new technic, as a supplement to the present methods of treatment. If a coloured solution is injected into a closed tube filled with water the solution is seen to diffuse immediately throughout the tube; but if a small amount of air is injected immediately before the solution, in the same continuous injection, the air forms an air block which expels all the water from a section of the tube, the coloured solution running down the sides of the tube in this air space before diffusing through the water below. If the same technic is used in the injection of varicose veins, using 1 cc. of air and 1 cc. of Sodium morrhuate or other sclerosing agent injected in one continuous movement, the air block can be seen to expel the blood from a section of the vein (if the latter is thin and superficial), in which the concentrated sclerosing agent can come into close contact with the intimal lining before dilution by the blood occurs. Such vessels thrombose promptly and firmly, with an appreciably lower incidence of recurrence.

The amount of air should not exceed 3 cc. With this amount no tourniquet is necessary, and there is no danger of air embolism. Following removal of the needle, the injection site should be covered tightly by a cover of gauze held in place with adhesive tape, and the leg supported by an elastic bandage. The method should not be used for very large veins, but only for small or medium veins which are ordinarily treated by the 'full-vein' technic.

H. K.

UROLOGY I

223 Cases of Sulfa-resistant Gonorrhea Treated with 50,000 Units of Penicillin

The Journal of Urology Dec. 1944.

It is shewn that after treatment with 50,000 units there is a marked temporary bacteriostasis. The highest incidence of post-treatment positive and doubtful smears occurs between the seventh and fourteenth days. The majority of failures (34) were treated between the seventh and fourteenth days. Thirty-eight patients were retreated on account of residual urethral discharge, hazy urine and persistent smears and cultures.

47 of the primary 55 failures promptly cleared on retreatment with 100,000 units. The remaining eight carefully examined for hyperpyrexia treatment. One disqualified on a nervous basis. The remaining failures were treated with hyperpyrexia and 100,000 units of penicillin administered intravenously during the fever treatment. This resulted in four cures and three failures. Two of the three failures cured by oral sulfapyridine. The last patient cured following transurethral surgery, local treatment and 1,000,000 units of penicillin.

It is considered that 50,000 units of penicillin is insufficient to clear the average male of gonorrheal infection. Retreatment with 100,000 units will clear 85% of the 50,000 unit failures. Hyperpyrexia and 100,000 units penicillin will cure 30% of penicillin-resistant gonococcus. Carriers may be produced by insufficient penicillin dosage.

160,000 units penicillin intramuscularily produced the highest percentage of cures—98%.

M. S. A.

OBSTETRICS I

Sodium Pentothal Anesthesia in Obstetrics

American Journal of Obstetrics and Gynecology Dec. 1944.

This is a report of 1415 deliveries conducted under sodium pentothal anesthesia at Johns Hopkins Hospital. Solutions varying from 2.5 to 5.0% in strength were used and the amount of drug ranged from 0.75 gm. to 1.0 gm. for low forceps with episiotomy repair to 1.5 gm. for cesarian sections.

Intravenous administration of the drug for spontaneous delivery of an active, semiconcious obstetrical patient was found to be unsatisfactory.

Sodium pentothal was found to be on the whole a successful anesthetic in 963 operative deliveries. Of these 777 were low forceps deliveries and 114 cesarian sections.

Estimations were made of the blood levels of the drug in mother and child after various periods of anesthesia. During the first five minutes of administration the fetal blood level is very small. It equals that of the mother after approximately 12 minutes. In 1386 cases in which the fetal heart was heard prior to anesthesia, there were 33 stillbirths and neonatal deaths. In this group there were 12 premature infants, 5 with congenital abnormalities and 8 suffered intracranial hemorrhage. There were two maternal deaths—both eclamptic patients.

The authors recommend sodium pentothal as a routine for low forceps deliveries and cesarian section but not as an ideal obstetrical anesthetic.

I. D. M.

"They know I'll be home every night at a quarter to six. If I'm delayed, they depend on me to telephone.

"They depend on me for a lot of things.

"If the day should come when I don't come home . . . I want them to go on depending on me just the same.

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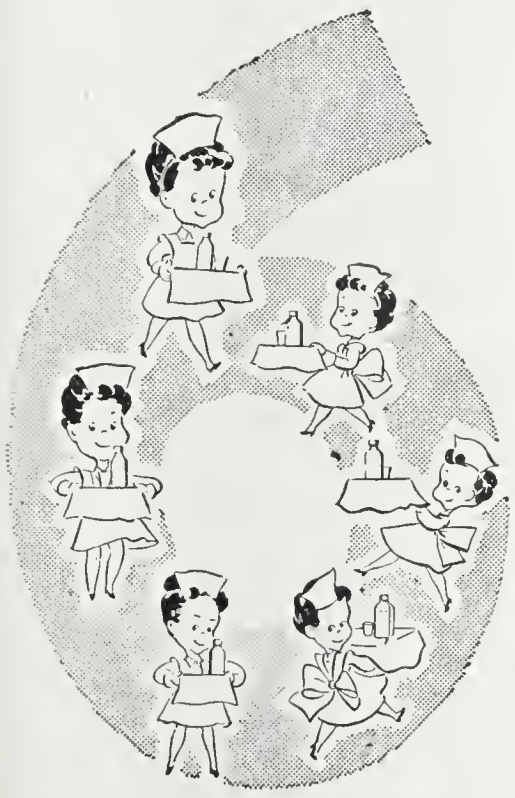

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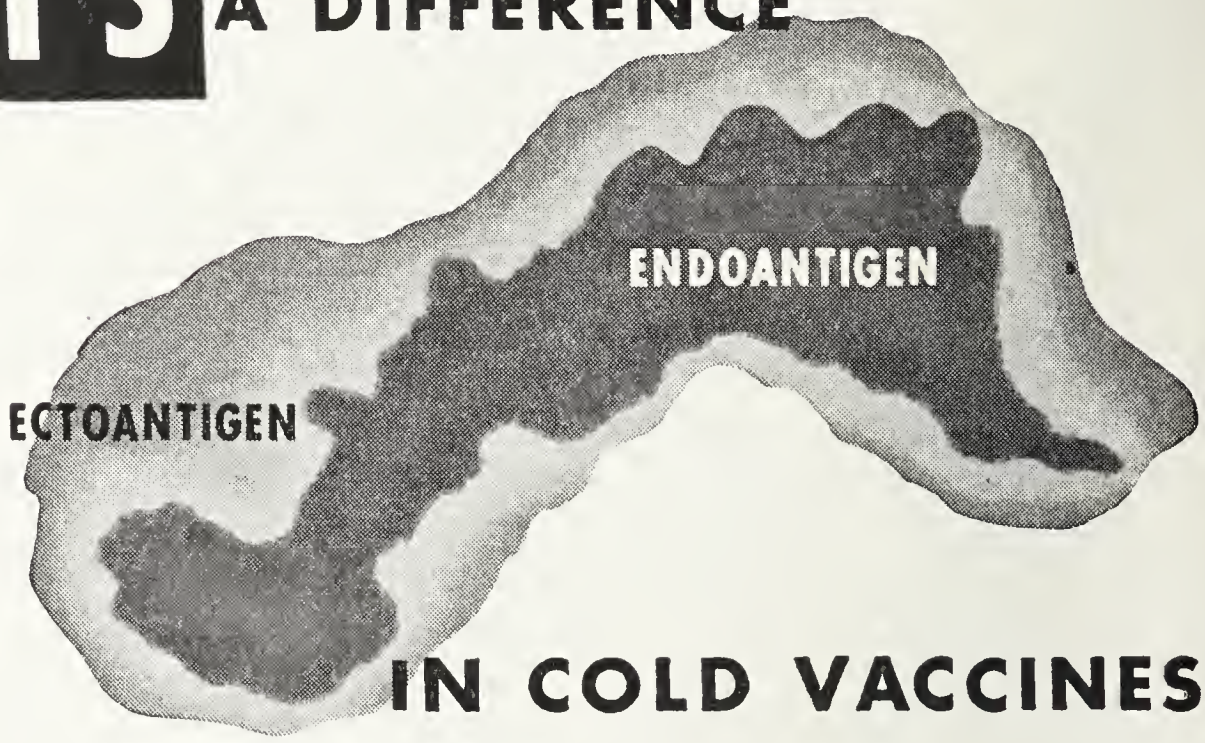

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VITAMIN D has been so successful in preventing rickets during infancy that there has been little emphasis on continuing its use after the second year.

But now a careful histologic study has been made which reveals a startlingly high incidence of rickets in children 2 to 14 years old. Follis, Jackson, Eliot, and Park* report that postmortem examination of 230 children of this age group showed the total prevalence of rickets to be 46.5%.

Rachitic changes were present as late as the fourteenth year, and the incidence was higher among children dying from acute disease than in those dying of chronic disease.

The authors conclude, "We doubt if slight degrees of rickets, such as we found in many of our children, interfere with health and development, but our studies as a whole afford reason to prolong administration of vitamin D to the age limit of our study, the fourteenth year, and especially indicate the necessity to suspect and to take the necessary measures to guard against rickets in sick children."

*R. H. Follis, D. Jackson, M. M. Eliot, and E. A. Park: Prevalence of rickets in children between two and fourteen years of age, Am. J. Dis. Child. 66:1-11, July 1943.

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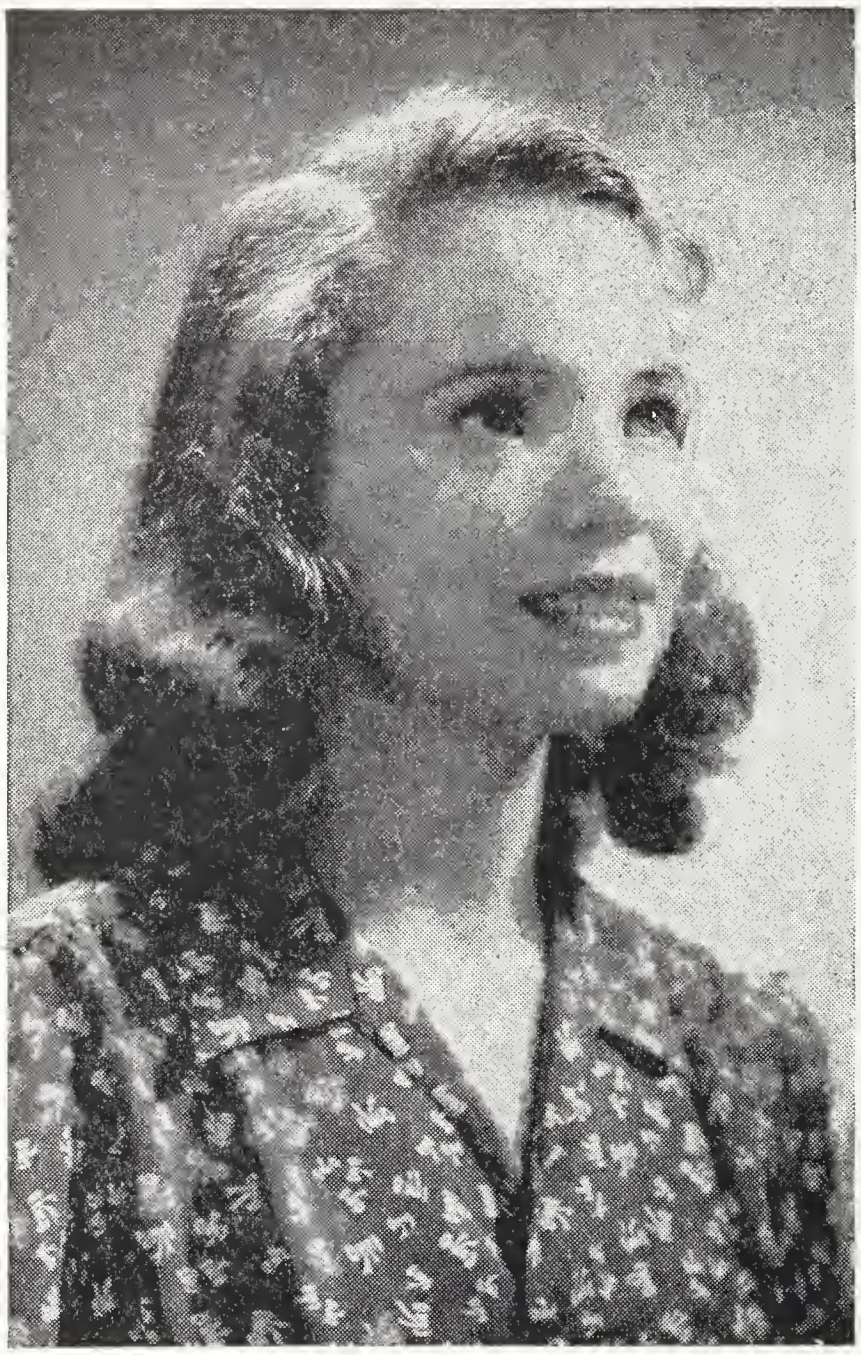

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A WOMAN!

Psychically
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